AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

NOVEMBER 15, 1955

In This Issue

Latest Developments at Paris and London Shows
Studebaker and Nash Announce 1956 Models
New Integral Power Steering Gear by Saginaw
Motor Vehicle Registrations at 61,309,000 Mark
Plymouth's Completely New Engine Plant
West Coast Forum on Aircraft Production Problems

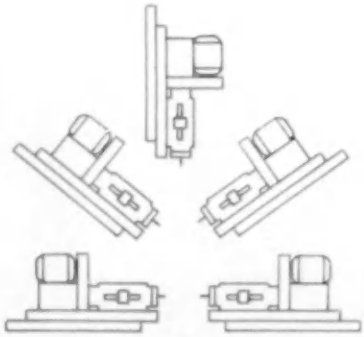
COMPLETE TABLE OF CONTENTS, PAGE 3

A CHILTON PUBLICATION

new

HEALD SLIDE UNIT BORE-MATICS

approach any borizing problem
from the **RIGHT ANGLE**



Slide Units can be easily arranged to approach the work from any desired angle. Multiple stations can be combined on a single base with identical or consecutive operations at each station, for maximum production efficiency.

With the new line of Heald Slide Unit Bore-Matics, the machine can be adapted to the work—not the work to the machine. For these compact, hydraulically operated Slide Units, complete with boringhead and drive, can be arranged to approach the work from any desired angle—vertically, horizontally, or at any inclination best suited to the operations being performed and the nature of the work. That means greater adaptability to your specific job requirements. It means more efficient floor-to-floor cycles and higher production per machine-hour.

The two-station Vertical shown above is a typical example of modern Slide Unit design—boring, facing and chamfering aluminum torque converter housings at 88 parts per hour, gross. For the newest developments in precision finishing, IT PAYS TO COME TO HEALD.

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Subsidiary of The Cincinnati Milling Machine Co.
Worcester 6, Massachusetts
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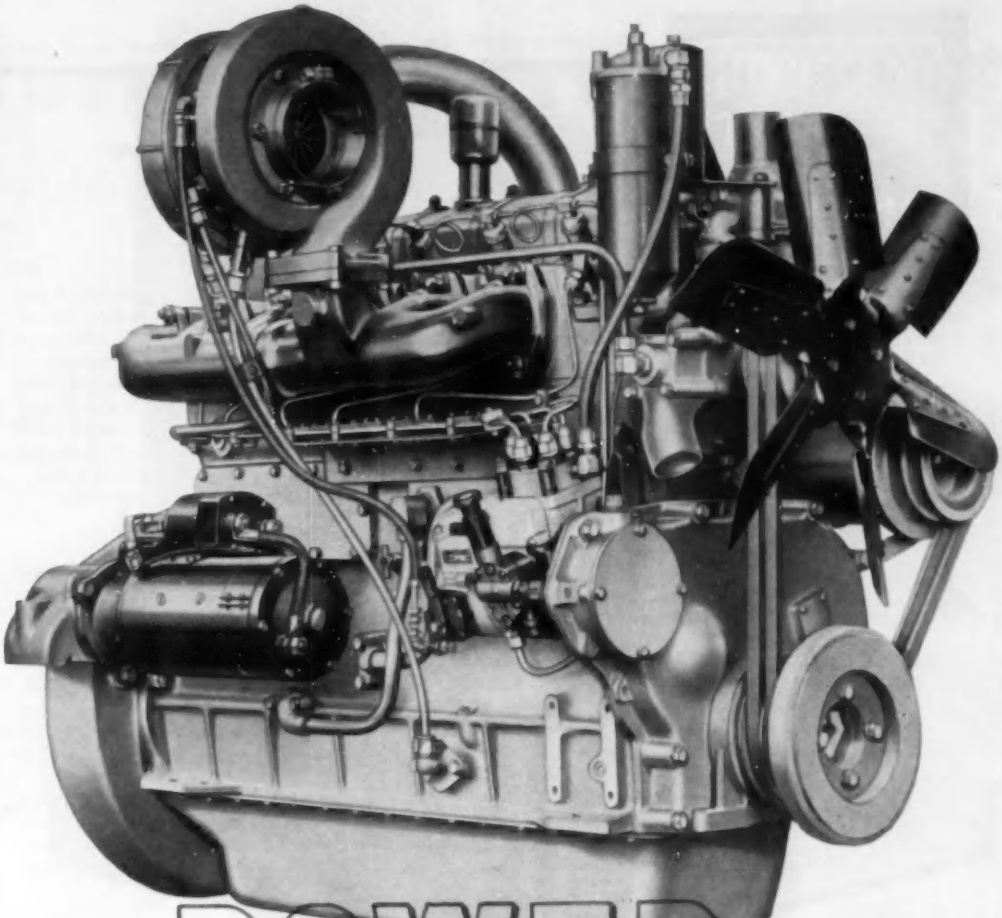
HEALD

Send for Bulletin 2-25-V



More POWER to you!

WAUKESHA Diesels

Specifically designed for reliable service—the Waukesha 135-DK Series high speed Diesels in the 130 hp to 185 hp range are setting high performance and economy records in re-powering over-the-road and off-the-highway heavy duty hauling units. Both are 426 cu. in., six-cyl., 4¼-in. x 5-in. The 135-DKB Normal Diesel develops 147 hp at 2800 rpm. In the 135-DKBS Diesel (shown) output is boosted to 185 hp at the same rpm by turbo-supercharging.

WAUKESHA MOTOR COMPANY
Waukesha Wisconsin
New York • Tulsa • Los Angeles

260-B-1

MATTISON
HIGH-POWERED PRECISION

GRINDING METHODS

Grinds two sides of connecting rods and caps at rate of 375 each, per hour

Four high-powered spindles progressively finish rough forgings to close tolerances.

Machining flat surfaces at high speed and low cost is the most important single advantage of using the Mattison No. 72 Rotary Automatic Grinder. In this application, a four spindle No. 72 does continuous, single-pass grinding of two sides on automotive connecting rods and caps at a production rate of 375 each, per hour. Because of this high production rate, it was necessary to set up automatic cam-actuated clamping and unclamping devices. The operator merely loads and unloads pieces without stopping the machine.

Centralized automatic feeds simplify control, save inspection time, and minimize nonproductive machine time. An automatic feed mechanism operates the wheel feed screws to compensate for wheel wear as gauged by work sizers. When pieceparts approach their high limit, the machine feeds down a predetermined amount from .0001 to .001 in. Accuracy of feed is within .0001 in.

The No. 72 Rotary Automatic has the high horsepower required to take advantage of today's improved grinding wheels, and provide fast stock removal and free-cutting action on a wide range of work. Bulletin No. 147-2 tells the complete production story of this grinder.

MATTISON
MACHINE WORKS

HIGH-POWERED
PRECISION
SURFACE GRINDERS

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE — PUBLISHED SEMI-MONTHLY

NOVEMBER 15, 1955 — VOL. 113, NO. 10

FEATURES

SAE Aeronautic Meeting. *By R. Raymond Kay*.... 52
London Show Features. *By David Scott*..... 54
Hydraulics Conference. *By Paul Kennedy*..... 57
Studebaker Cars for 1956..... 58
Paris Automobile Show. *By W. F. Bradley*..... 60
Nash Offers Choice of Engines and Drives..... 62
Facts About Public Sale of Ford Stock..... 63
Automatic Engine Assembly and Testing at Plymouth Plant. *By Joseph Geschelin*..... 64
Automatic Production of Dynaflow Pump Covers.. 70
AGMA Meeting Discusses Gear Quality..... 72
Saginaw Introduces Integral Power Steering Gear. *By C. W. Lincoln*..... 73
NMTBA Meeting Predicts High Machine Tool Sales. *By Thomas Mac New*..... 74
1955 Motor Vehicle Registrations Indicate 5.7 Per Cent Increase. *By Marcus Ainsworth*..... 75
Metal Show Review 76
Machining of Integral Stiffened Spars..... 98
Forged Aluminum Equalizer Beam Saves Weight.. 106

NEWS PREVIEWS

Packard Clipper Cars Priced Higher..... 37
GM Earnings Hit Record Peak..... 37
New Parts Plant To Be Erected By Ford..... 38
Buick, Olds and Cadillac Hike '56 Prices..... 38
Ford Expects Profits to Top 21 Pre-War Years.... 39
Goodyear Increases Tire Prices..... 39
Douglas Awarded $175 Million Jet Order..... 40
Olds Plans 50 Per Cent Boost in Output..... 40
Checker Cab to Build Dual-Purpose Vehicle..... 40
Chevrolet Buys Another Plant in Toledo..... 41
Ford Says 20% of Buyers Requesting Seat Belts.. 42
Rathborne, Hair & Ridgway Marks Anniversary... 42
Goodyear's New Synthetic Rubber..... 43
Austin-Healey 100 Sports Car..... 43

DEPARTMENTS

High Spots of This Issue..... 35
News of the Automotive and Aviation Industries.. 37
Men in the News 45
Machinery News. *By Thomas Mac New*..... 83
New Plant and Production Equipment..... 84
Free Literature and Free Information Service.... 93
New Automotive and Aviation Products..... 96
The Business Pulse 100
Airbriefs. *By Ralph H. McClarren*..... 102
On Our Washington Wire..... 172
Calendar of Coming Events 174
Shorties 190
New Defense Facilities..... 201
More Defense Contract Awards..... 202

Business Department Staff..... 35
Chilton Officers and Directors..... 35
Advertisers' Index 264

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80 million
is a lot of
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That's well over half of all the sealing rings that have ever been made—because Sealed Power is far and away the largest manufacturer of rings for automatic transmission and power steering.

It all began away back before World War II, when tanks needed sealing rings. Sealed Power, with its long experience and fine engineering staff and laboratory facilities, was the natural source of supply. That was seventeen years ago.

Now Sealed Power makes sealing rings for passenger cars, trucks, buses—and, of course, for tanks. Sixteen of the nineteen makes of cars now using automatic transmissions use Sealed Power sealing rings.

Sealed Power is best qualified to help you solve your own sealing ring problem. Your inquiry will receive prompt attention.

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Largest Producer of Sealing Rings for Automatic Transmissions • Power Steering Units

How Hy-Loads can help you...

PROVIDE HORIZONTAL FLOAT

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Ever have herringbone gears bind on you because the shaft couldn't float freely to permit the gears to mate properly? It can happen when you use laterally locked bearings—*but it can't happen here!*

The designer of this pump assembly has made doubly durn sure *he* won't get into trouble—by specifying HYATT A-6200-T Cylindrical Roller Bearings. *First*, he knows they'll provide plenty of lateral float so the herringbone gears can mesh freely (and to take care of possible shaft expansion in case hot liquids are pumped). *Second*, a single bearing with two rows of rollers gives him maximum load capacity in minimum space—without any possibility of overload on one bearing or the other that might creep in if he used two separate bearings.

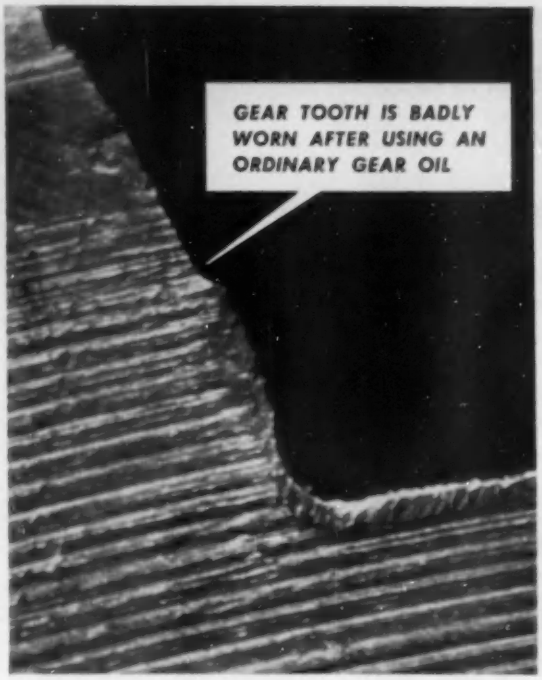
If you haven't a HYATT General Catalog No. 150 handy, better send for yours pronto, brother—it'll save you a heap of time and headaches! *Remember, you can't go awry when you specify—*

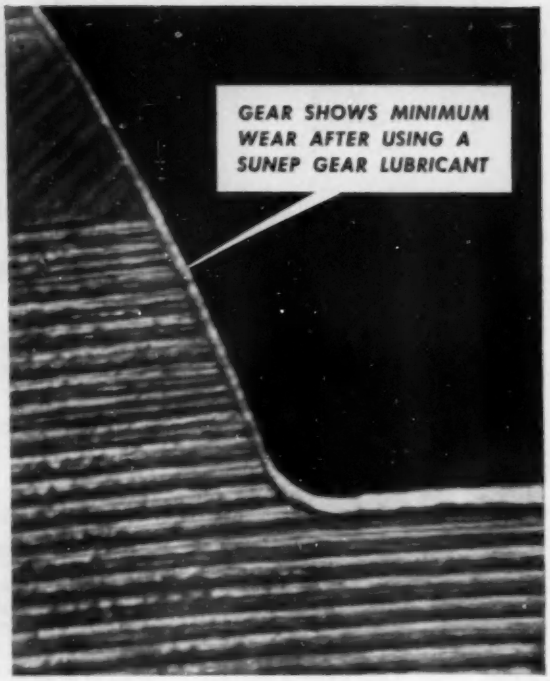
your COMPLETE LINE of cylindrical roller bearings

HYATT ROLLER BEARINGS

STRAIGHT BARREL TAPER

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION • HARRISON, NEW JERSEY





COMPARATIVE TESTS on identical new worm gears demonstrate superiority of Sunep Gear Lubricant. Gear on left, using a compounded cylinder oil, shows excessive wear at 70 hours. Gear on right, protected by Sunep, shows minimum wear after running over 200 hours!

HERE'S PROOF SUNEP GEAR LUBRICANTS MINIMIZE WEAR

Sunep Gear Lubricants cut power losses...protect against overloads ...lengthen gear life...reduce maintenance costs and replacements.

During recent tests gear units protected by Sunep Gear Lubricant showed an absolute minimum of wear when run at normal rated capacity. There was no indication of scoring or wear even when run at overloads up to 118%! Power consumption was reduced up to 25%. Damage from shock loads was nil.

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For complete information about how Sunep Gear Lubricants can help give longer life to your worm gear units, see your Sun representative...or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AA-11.

SUNOCO

INDUSTRIAL PRODUCTS DEPARTMENT

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Carefully engineered, long-life gaskets and oil seals prevent undue loss of compression, lubricants, coolant and hydraulic operating fluid. Caterpillar specifications require quality in sealing parts—and that makes this power-full difference.

Victor sealing is quality sealing—for all types of automotive, earth-moving, marine, industrial and agricultural machinery. Continuing research and development by Victor assure you of the best sealing materials . . . the widest choice for every need . . . and each Victor packing is clearly defined and classified by ASE-ASTM specifications.

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Here is where Burton reliability is indispensable. "Good Nabors" need good springs . . . for springs influence the performance of the entire vehicle that rides on them.

Follow the example of America's leading trailer and truck builders. Bring your spring problems to the attention of Burton's engineering staff. We invite consultation.

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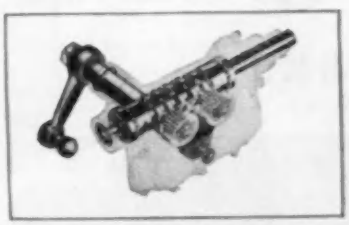
▶ **Huge earthmoving** equipment such as that pictured above easily takes gruelling quarry work in stride. Among its many outstanding features—for trouble-free economical heavy-duty operation—is easy, safe, dependable Ross STEERING.

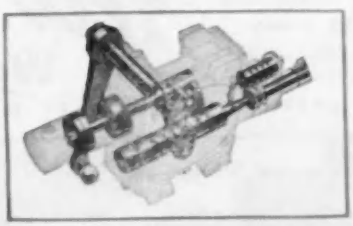
Throughout 49 years of exclusive steering service to the automotive industry, Ross gears have been distinguished for long life, simplicity of adjustment and maintenance of long-recognized qualities of steering *ease*, *safety*, *stability* and *performance*.

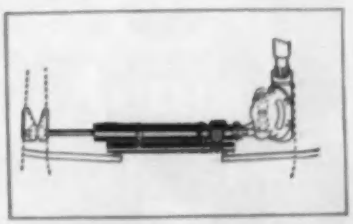
Ross invites discussion of any steering problem—manual or power.

ROSS GEAR AND TOOL COMPANY, INC. · LAFAYETTE, INDIANA

Ross STEERING







CAM & LEVER MANUAL . . . HYDRAPOWER INTEGRAL . . . HYDRAPOWER LINKAGE

PRECISION-CUT PARTS

our business since 1899

There is no phase in the production of wool felt in which Western Felt is not engaged. We start with lambs wool, and end with an endless variety of parts for the many jobs that only felt can perform.

Through it all, we're proud to say our methods have built an enviable reputation for engineering precision. Hard or soft, large or small, Western Felts can be relied upon to meet your specifications.

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Felt **WORKS**

MANUFACTURERS AND CUTTERS OF WOOL FELTS

The *Problem Jobs* GO TO AETNA

Here's one of motordom's finest torque converters and its one-way, 20 sprag clutch unit—big reasons why today's automatic transmissions send engine power to the wheels in a single, uninterrupted stream of mounting energy—so smoothly, so quietly you can hardly tell when they shift.

Why, since we make only the outer and inner races of this one-way clutch unit, do we call it a problem job? You should see the complex "specs", the super-rigid standards these races must meet . . . in squareness, concentricity, parallelism, size and finish . . . in the selective hardening and grain structure of the steel. In all, 59 specifications to the set.

To uniformly maintain such a galaxy of high standards, the torque converter makers knew from the start they had a ticklish job calling for a top-flight supply source. In turning it over to Aetna what appealed to them was not only Aetna's matchless experience, skill and special interest in hard-to-make parts, but also Aetna's proven ingenuity in innovating processing and control methods to make them better, faster and most economically.

Our staff of engineers, metallurgists and designers can help you too—from the inception of your ideas or problems to the final answers and applications of special ball bearings, roller bearings and miscellaneous bearing-type parts. A note from you will bring prompt action.

Standard and Special Ball Thrust Bearings • Angular Contact Ball Bearings • Radial Ball Bearing Mounted Units • Special Roller Bearings • Ball Retainers • Hardened and Ground Washers • Sleeves • Bushings • Miscellaneous Parts

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Division of Parkersburg-Aetna Corporation
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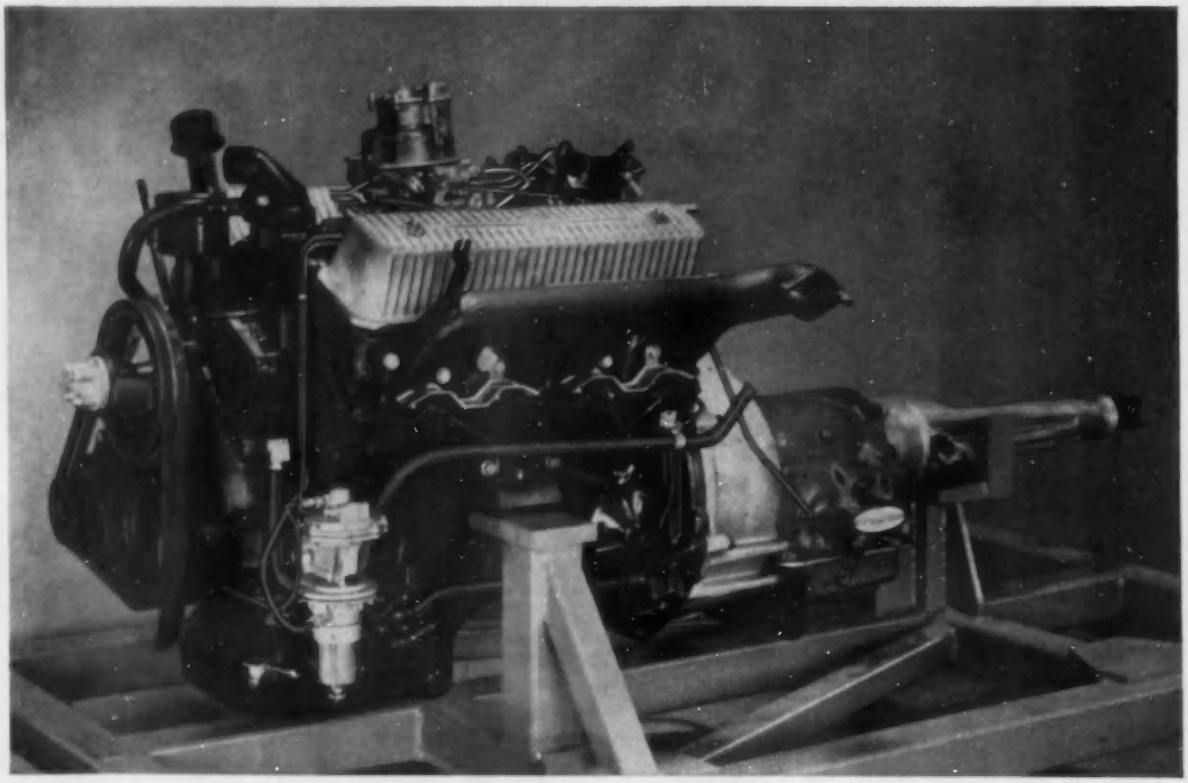
In Detroit: SAM T. KELLER, 2457 Woodward Ave.

Bundyweld Tubing is of distinguished,

Mechanical appointments in luxurious Continental feature 30 parts made of Bundyweld Tubing—a total of 87½ feet of tubing in each car



This smooth, quietly operating engine uses Bundyweld Tubing for vital gas, oil, gauge, and lubrication lines. Bundyweld gives dependable, precision performance necessary in distinctive automobiles, such as the Continental. It is a sturdy, leakproof tubing that withstands heavy vibration fatigue and punishing wear, has a high fatigue limit. It is produced in sizes up to ⅝" O.D.

WHY BUNDYWELD IS BETTER TUBING

Bundyweld starts as a single strip of copper-coated steel. Then it's . . .

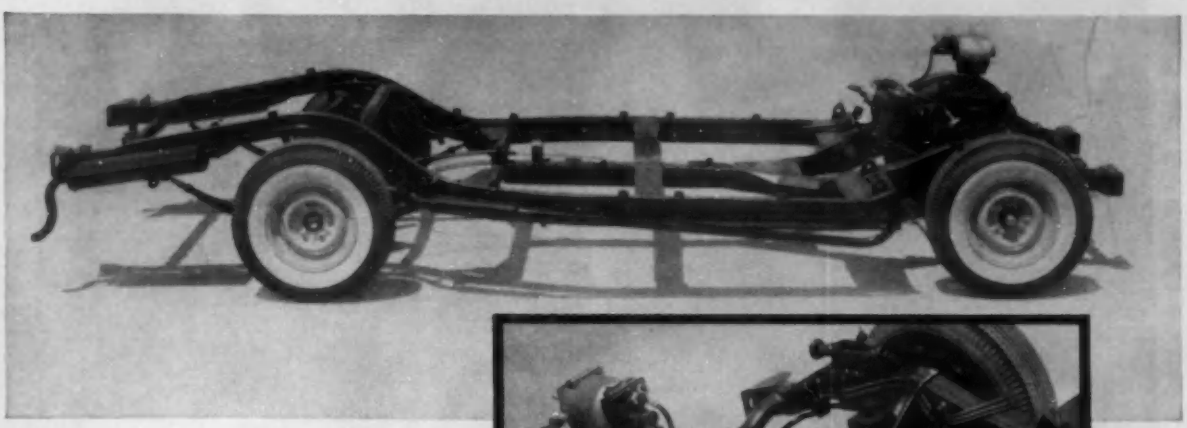
continuously rolled twice around laterally into a tube of uniform thickness, and

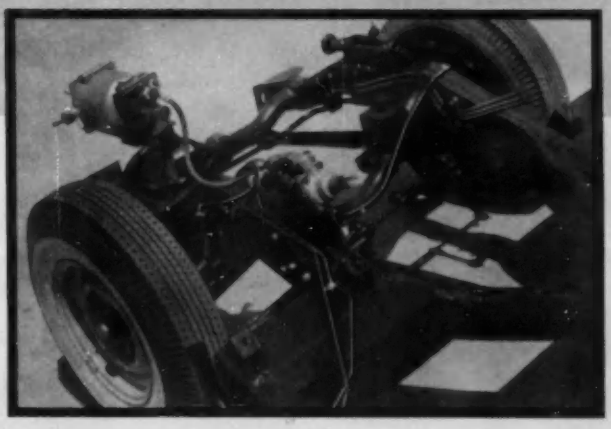
passed through a furnace. Copper coating fuses with steel. Result . . .

Bundyweld, double-walled and brazed through 360° of wall contact.

← NOTE the exclusive Bundy-developed beveled edges, which afford a smoother joint, absence of bead, and less chance for any leakage.

used for the "lifelines" new Continental





Bundyweld is also used in the distinguished Continental for brake, heating, air-conditioning, and control lines. This quality tubing is thinner walled, yet stronger; has high bursting strength; takes easily to standard protective coatings. (Illustrations show Bundyweld in copper – its "from the mill" color. Actually, on the Continental, it is solder-coated, with exposed parts painted as it is assembled.)

Whatever the automotive application for Bundyweld Tubing – ranging from powerful and distinguished cars like the Continental, to rugged automotive giants of farm and industry – you can be sure of dependable performance with Bundyweld STEEL Tubing. Only STEEL tubing is strong enough to take punishing wear, and give added safety in mechanical operations.

Bundyweld Tubing is used by leading automotive manufacturers like the Continental Division, Ford Motor Company, for hydraulic lines to assure safe stops. It is preferred, too, for oil lines, to save costly repairs; for gasoline lines, to assure leakproof performance; for push rods, to produce more powerful overhead-valve engines. In fact, Bundyweld *is used in 95% of today's cars, in an average of 20 applications each!*

There are expert technicians at Bundy available to help you with your tubing problems. We have advanced facilities for fabrication, and offer prompt, on-schedule delivery. Why not get in touch with us today?

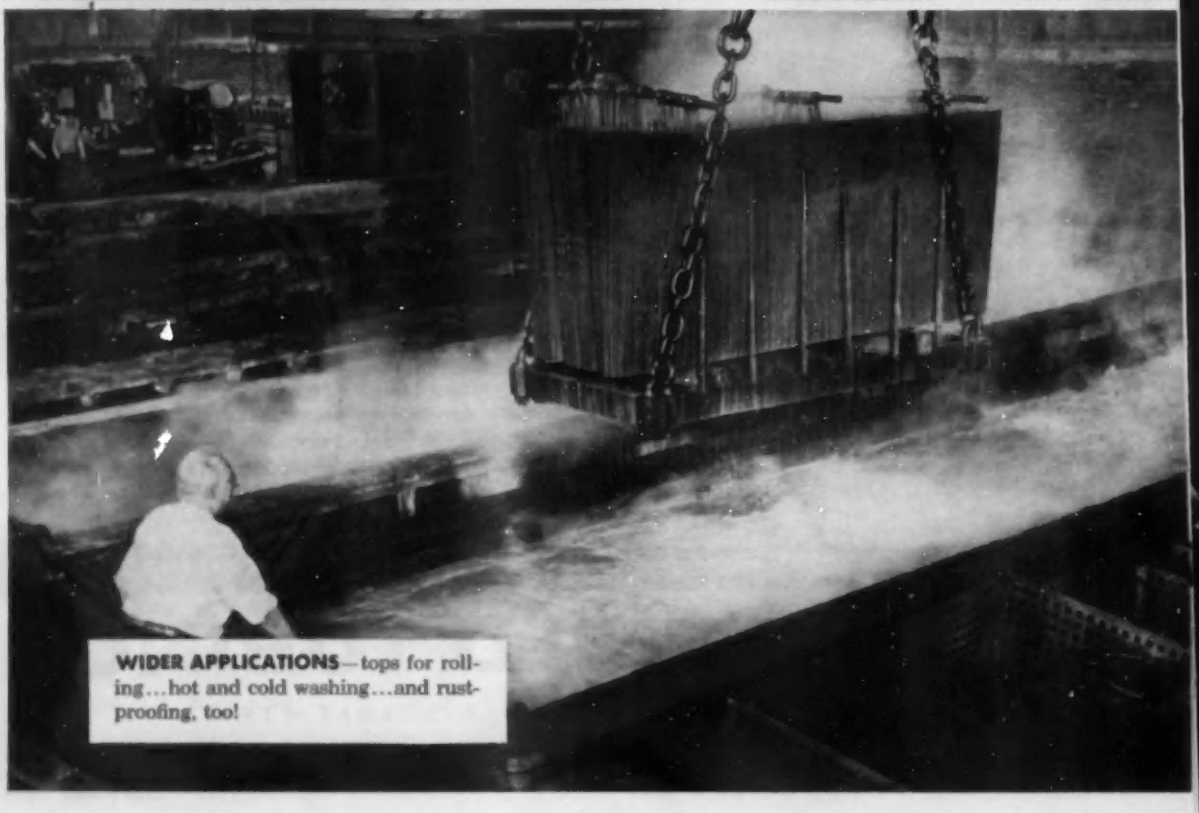
BUNDY TUBING COMPANY
DETROIT 14, MICHIGAN

BUNDYWELD TUBING®

DOUBLE-WALLED FROM A SINGLE STRIP

Bundy Tubing Distributors and Representatives: Cambridge 42, Mass.: Austin-Hastings Co., Inc., 226 Binney St. • **Chattanooga 2, Tenn.:** Pelram-Deakins Co., 823-824 Chattanooga Bank Bldg. • **Chicago 32, Ill.:** Lapham-Hickey Co., 3333 W. 47th Place • **Elizabeth, New Jersey:** A. B. Murray Co., Inc., Post Office Box 476 • **Los Angeles 58, Calif.:** Tubecales, 5400 Alcoa Ave. • **Philadelphia 3, Penn.:** Riton & Co., 1717 Sansom St. • **San Francisco 10, Calif.:** Pacific Metals Co., Ltd., 3100 19th St. • **Seattle 4, Wash.:** Eagle Metals Co., 4755 First Ave., South **Toronto 5, Ontario, Canada:** Alloy Metal Sales, Ltd., 181 Front St., E. • **Bundyweld nickel and Monel tubing are sold by distributors of nickel and nickel alloys in principal cities.**

GREATER COOLING POWER—better finishes...tools last longer...production costs reduced.



WIDER APPLICATIONS—tops for rolling...hot and cold washing...and rust-proofing, too!

INCREASED DETERGENCY—prevents loading and glazing of grinding wheels, prolongs wheel life.

NEW S.E.C.O.—pours and mixes easily... has better operator acceptance... keeps parts and machines cleaner.

Industry's most widely used soluble cutting oil continues to give highest machining efficiency

OVER 100 MILLION GALLONS OF S.E.C.O. EMULSIONS USED IN '54

The reasons? Simple.
Primarily, industry has faith in Sunoco Emulsifying Cutting Oil. Its high machining efficiency has proven itself over a period of years. S.E.C.O. is the original 100% petroleum emulsifying cutting oil. 'Way back in 1916, machinists started using S.E.C.O.

Constantly improving in quality over the years, S.E.C.O. is now better than ever. During 1954 new refining facilities once more improved industry's most widely used cutting oil... gave users even higher machining efficiency ...better finishes...longer tool life... increased production.

Test the new S.E.C.O. in your own plant. Notice how its high detergency and purity keeps tools, parts and machines clean...how easily it mixes in hot, cold or hard water. Notice, too, how S.E.C.O. cuts operating costs... improves rolling operations, hot and cold washing, and rustproofing.

See for yourself why Sun's S.E.C.O. continues to be the leading emulsifying cutting oil in the country today. For information, call your nearest Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AA-11.

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INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

PHILADELPHIA 3, PA.

IN CANADA: SUN OIL COMPANY LTD., TORONTO AND MONTREAL

if the FLEET OWNER built his own trucks—

ZENITH CARBURETORS

would be *his* choice

They say it's a buyer's market. Well the truth is, for the truck operator, it's always been a buyer's market.

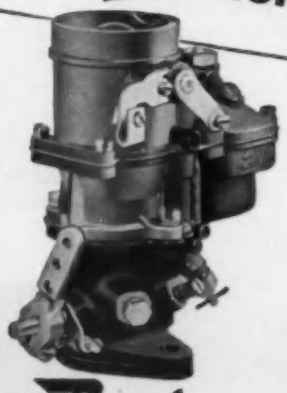
No American businessman sets more exacting standards than the fleet operator in his purchase of new equipment. There is good reason for this, for the operator's success or failure is to a very large degree determined by the efficiency of the vehicle he employs.

This yardstick of efficiency is likewise applied to every component part that contributes to truck performance.

That's why you can be certain if truck operators built their own trucks, Zenith* would be the choice for standard equipment.

One more reason why—if you build, buy, sell or operate trucks, Zenith should be *your* choice for the best in carburetion.

*REG. U.S. PAT. OFF.



ZENITH CARBURETOR DIVISION OF Bendix AVIATION CORPORATION

696 Hart Avenue, Detroit 14, Michigan • Export Sales: Bendix International Division, 205 East 42nd St., New York 17, N. Y.

Production Pointers from GISHOLT

MASTERLINE GISHOLT SINCE 1887

TIME-SAVING IDEAS

Highlighting the great, new Gisholt MASTERLINE Machines—emphasizing new strides in efficiency and in lowering unit costs on a variety of jobs.

SPEEDS UP WORM SHAFT OUTPUT

New Gisholt No. 12 Automatic with JETracer turns trick

Here's how to boost production and cut costs on steel traverse worm shafts, using the new Gisholt MASTERLINE No. 12 Automatic Production Lathe.

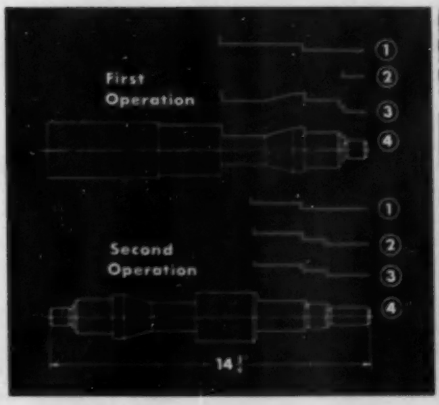
Special equipment includes a Gisholt JETracer Slide mounted on the front carriage, plus a new triangular shaped tool post—hydraulically operated and automatically indexed—carrying a roughing and finishing tool. This arrangement permits maximum tool clearance with a minimum of overhang. Machining is fast, with a spindle speed of 900 RPM and a 40 HP motor providing power for the heavy roughing cuts.

For the first operation, the rough bar stock is held between centers and driven by a work driver. As indicated in the drawing, one end of the part is rough and finish turned in four consecutive automatic passes. The tool post indexes automatically, presenting the finishing tool to the work for the final pass. At the same time, the grinding relief is formed from the rear independent slide. Floor-to-floor time: 3 minutes.

The second operation is equally easy and simple: the work driver jaws, templates and rear independent slide tools are changed—and the part is completed by four more automatic passes, with grinding reliefs formed from the rear independent slide during the finish turn. Floor-to-floor time: 2.80 minutes.

On this job, four consecutive automatic passes are made with four different templates to complete each operation.

New design refinements give Gisholt No. 12 MASTERLINE Automatic Production Lathe even greater capacity, versatility and ease of operation.



Special cam carrier indexes to present different template for each pass.

Closeup shows Gisholt JETracer Slide and automatic indexing tool post.

MASTERLINE GISHOLT SINCE 1887

TIME-SAVING IDEAS

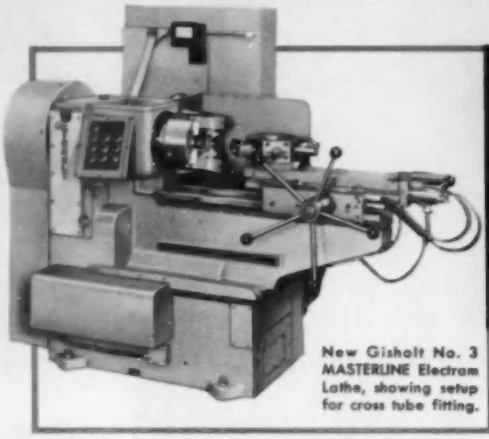
FOUR ENDS MACHINED IN SINGLE OPERATION

New Electram with pre-set controls boosts production

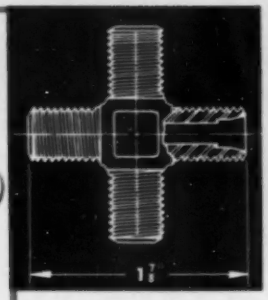
Here is a fast, positive, low-cost solution to handling parts requiring machining on two or more ends or sides—such as small to medium valves, tees, crosses, etc.

The machine is the new Gisholt MASTERLINE No. 3 Electram Lathe. The workpiece is a steel union cross tube fitting. All four ends are machined in a single chucking.

A Gisholt-Weatherhead Chuck is used to permit power indexing of the workpiece without stopping the spindle. Electrical controls at the rear of the turret ram are pre-set for each turret station and govern spindle speed, spindle reverse for tapping, spindle stop and single or double indexing of the hexagon turret.



New Gisholt No. 3 MASTERLINE Electram Lathe, showing setup for cross tube fitting.



Steel union cross tube fitting, showing surfaces machined on all four ends.

Hexagon turret tools face, chamfer, center, turn O.D., drill, form a 24-degree angle seat and a 15-degree angle bushing seat at all four ends. The workpiece is indexed in the chuck, so that tools on each hexagon turret station machine all four ends before indexing to the next turret station. To complete the part, all four ends are threaded, with the spindle reversing each time to withdraw the die head. Floor-to-floor time? Just 1.50 minutes.

Through this well-planned setup, multiple operations are handled on each of four ends of union cross tube fittings—with high volume output at lowest cost.

JETracer SAVES ON TIME, TOOLING COSTS, INSPECTION

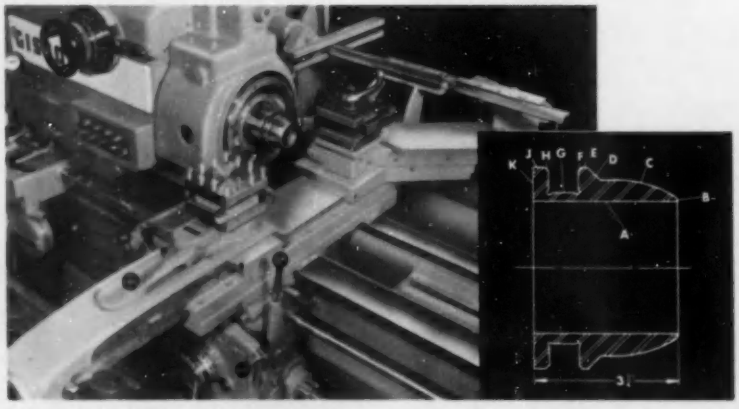
Simple application on Saddle Type Turret Lathe

The problem: how to machine steel bar feed wedges from 4½" diameter stock in one fast operation.

The solution: a new Gisholt MASTERLINE 2L Saddle Type Turret Lathe, equipped with a JETracer and a 40 HP motor.

To feed the 4½" diameter bar stock through the 4⅝" spindle bore, an outside operated collet chuck is used. The JETracer, mounted on the rear of a bridge-type cross slide, provides an economical means of accurately machining the contoured O.D. of the wedge. Considerable time is saved, tooling costs are reduced and inspection is greatly simplified.

Machining begins with the rough bar stock fed through the collet, against a hexagon turret stop. Other hexagon turret tools start drill, drill and rough and finish bore A. A single



All surfaces handled in one fast operation. Close-up shows JETracer on rear of bridge-type cross slide.

cutter turner reduces the stock O.D. in preparation for contour turning. Square turret tools rough and finish groove and chamfer F-G-H. The JETracer carries two tools (in an indexing-type square turret) which rough and finish generate B-C-D-E-J in two quick passes. The bar feed wedge is cut off at K from the front of the cross slide, and the job is finished. F.t.f. time is 8.50 minutes.

Time is saved and inspection is simplified on this job through a most modern machine and smart tooling.

GISHOLT

TIME-SAVING IDEAS

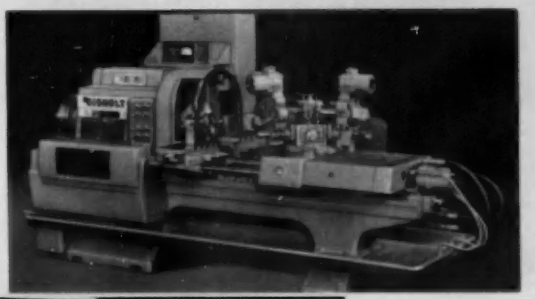
NEW FASTERMATIC CUTS SETUP TIME 50%

Simple toggle switches govern all machine functions

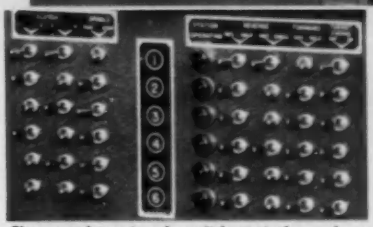
This new Gisholt MASTERLINE 2F Fastermatic Automatic Turret Lathe makes quick work of steel gear blank forgings. The secret is a new, electrically-controlled setup panel which simplifies and shortens set-up.

GEAR A—*Operation 1:* Hexagon turret fully tooled for both operations. Stations 3 and 6 bypassed. Stations 1, 2, 4 and 5 machine A-D-G-H. Cross slide tools machine B-C-E-F. F.t.f. time: 5.05 minutes. *Operation 2:* Change-over—one hour. Cross slide tools and chuck jaws changed, cross slides set to operate with stations 3 and 6. Stations 1, 2, 4 and 5 by-passed. Stations 3 and 6 machine M-J. Cross slide tools machine K-L-N-P. F.t.f. time: 1.50 minutes.

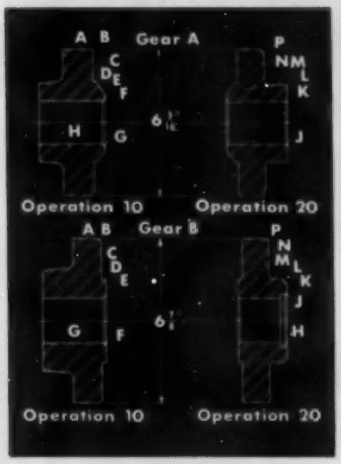
GEAR B—*Operation 1:* Change-over—1¾ hours. Adjust tools on stations 3, 4, 5 and 6 and change on stations 1 and 2 and on cross slides. Chuck jaws and spindle speeds changed and cross slides set to operate with stations 1 and 4. Stations 3 and 6 by-passed. Stations 1, 2, 4 and 5 machine A-F-G. Cross slide tools machine B-C-D-E. F.t.f. time: 5.75 minutes. *Operation 2:* Change-over—1 hour. Cross slide tools and chuck jaws changed, cross slides set to operate with stations 3 and 6. Stations 1, 2, 4 and 5 by-passed. Stations 3 and 6 machine M-H-J. Cross slide tools machine K-L-N-P. F.t.f. time: 1.39 minutes.



New Gisholt MASTERLINE Automatic Turret Lathe, designed to cut setup time 50%.



Close-up shows toggle switch control panel on new Gisholt Fastermatic.



Initial setup of the new Fastermatic is fast—simple toggle switches are set to govern all machine functions. On re-runs, a master reference card is used to further setup time.

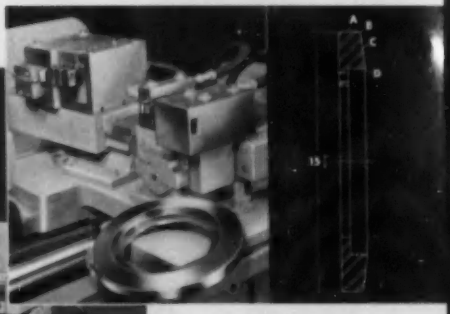
BEVEL GEAR FORGINGS IN 1.75 MINUTES F.T.F. TIME

New MASTERLINE Simplimatic does low-cost job

Tough steel bevel gear forgings are a pushover on the new Gisholt Simplimatic Automatic Lathe.

Here's the operation: the part is centralized in the previously machined bore and chucked on the web in a draw-back clamp fixture. The platen table traverses forward, carrying slides and tools into position. The rear slide is set at the proper angle to machine the bevel face C. As the lead tool—held in a separate auxiliary slide—begins to feed, it is cammed to plunge into the face to roughing depth. Then, as slide movement continues, the lead tool feeds across with other rear slide tools following, to machine bevel face C and radius B. At the same time, front slide tools turn A and form radius D. F.t.f. time: 1.75 minutes.

New Gisholt MASTERLINE Simplimatic Automatic Lathe, designed for high-speed automatic machining operations.



Tooling setup for bevel gear job. Both slides have adjustable tops to speed tool setting. Rear slide has swivel base to simplify angular adjustment.

Fully automatic cycle of Simplimatic lets one man do two-man job; reduces f.t.f. time; cuts machining costs.

GISHOLT

MASTERLINE GISHOLT SINCE 1887

TIME-SAVING IDEAS

HIGH-SPEED OUTPUT ON VALVE TAPPETS WITH NEW GISHOLT SUPERFINISHER

Fully automatic handling speeds Superfinishing

Superfinished tappet with .005 inch crowned top.

Note cup-shaped stone over piece; pickup arms; ejector assembly and chamfer attachment.

New Gisholt MASTERLINE No. 81 High Production Superfinisher.

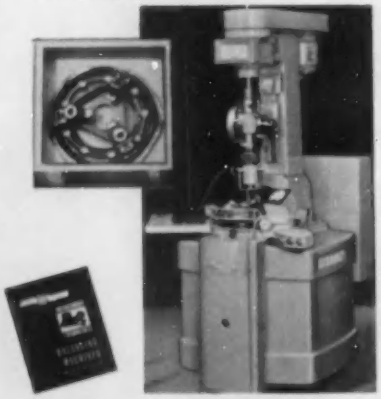
Here's how cast iron valve tappets are handled automatically on the new Gisholt MASTERLINE No. 81 High Production Superfinisher.

Cup-shaped stones are used, rotating off-center to generate a .005" crown on top of each tappet.

These parts are Superfinished from a flat ground surface down to 5 micro inches RMS or less. As each part is completed, a work transfer device with a left and right pickup arm is actuated. The left arm removes a rough part from a feeder conveyor, while the right arm receives the Superfinished part ejected from the spindle. Next, the transfer indexes so that the left arm is over the spindle and the right arm above a discharge conveyor. An ejector assembly pushes the rough workpiece into the spindle—the finished part onto the discharge conveyor. The transfer indexes to neutral, permitting the stone to engage the work. After Superfinishing, the stone retracts; a chamfering attachment operates, and the above cycle repeats. Floor-to-floor time is only 16 seconds per piece.

Superfinishing gives valve tappets longer life; automatic handling cuts costs.

Improved Gisholt Type 1SV1 DYNETRIC Balancing Machine setup for clutch and pressure plate assemblies (inset).



Write for free copy of Form 1165-A, the new Gisholt Type "S" Balancing Catalog.

No. 11-1255
643

LOCATES, MEASURES, CORRECTS, INSPECTS IN SINGLE HANDLING

Gisholt 1SV1 DYNETRIC Balancer handles 90 parts an hour

This is an interesting example of how the 1SV1 Balancer cuts costs, by minimizing the motions demanded of the operator.

Here, clutch and pressure plate assemblies are rotated as the operator observes angle and amount of unbalance in the same visual field. One unit on the amount meter represents 1/32" drill depth of a 9/16" diameter drill at the radius of correction. A simple scale on the drill press assures drilling to depth indicated on the meter. Angular location is read on a dial under a stroboscopic lamp.

To correct for unbalance, the operator stops the spindle, positions the part for correction at the observed angle, and lowers the drill. A chip removal tube comes down with the drill and removes chips as they are formed. A thrust device supports the work. After correction, the part is again rotated to assure balance within tolerance. The 90 parts an hour are handled at 80% efficiency.

Equipping a standard balancing machine with simple attachments assures maximum production with minimum effort.

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY — Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

MICROHONING* . . . FACTS YOU SHOULD KNOW

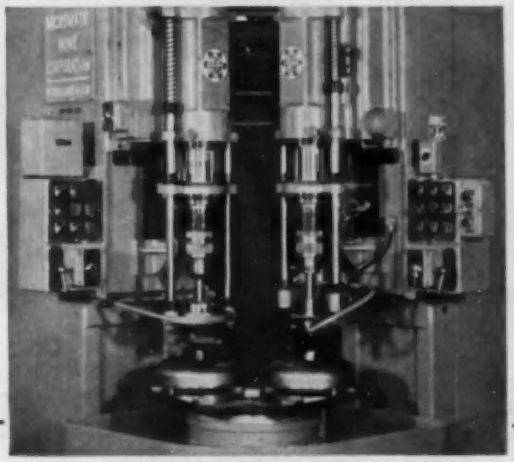
Compare These Microhoning Advantages

- Rapid and efficient stock removal.
- Dimensional accuracy obtained in every part.
- Macrogeometric accuracy—the Microhoning action is not affected by vibration; long abrasive stones generate a true surface.
- Microgeometric accuracy—any desired surface finish and cross-hatch angle duplicated in every part.
- No concentration of heat—the structural surface of the part is undamaged.
- Microhoning applications include tapers, spheres, splines, tandem or interrupted bores, flat surfaces, and any type of material, regardless of hardness (or softness).
- No practical limitation on part length and diameter.
- No chip removal problem—the minute Microhoning chips are flushed away in the coolant and automatically removed.
- Automatic size control.
- Readily adapted to automation.
- Eliminates tool dressing time and cost.
- Location of bores is undisturbed.
- Float principle and low speeds assure minimum maintenance.
- Backed by over 26 years of engineering and service experience.

PRECISION PRODUCTION THROUGH MICROHONING
MICRO MATIC

Microhoning is a low-velocity abrading process that employs thousands of small cutting tips. Because simultaneous and continuous cutting action of tips is spread over a wide area, stock is rapidly removed with a minimum of heating. This abrading technique generates functional surfaces ***by obtaining in one operation the required tolerances, specifications,*** or ***condition*** of the surface characteristics.

Included in these characteristics are: dimensional size (the distance between points or faces of a part, e.g., the diameter of a bore); macrogeometry (waves whose crests are more than 1/32" apart); microgeometry (roughness or scratches whose crests are less than 1/32" apart); and surface structure.



Microhoning . . . Example Application

Microhoning both I.D. and O.D. of the hub of a transmission torus cover to generate geometric accuracy and a surface finish of 10 microinches.

O.D.—*2.375", approx. 1" long, blind end*
I.D. —*2.125" x .280" long*
58-60 Rockwell "C"
Stock removal: *.001" to .002"*
Surface finish: *10 microinches*
Production: *180 per hour, gross.*

*MICROHONING = Stock Removal + Geometry + Size Control + Surface Finish

Movies describing various machining processes and the generation of functional surfaces are available for group meetings. For literature or further information on films, write to:

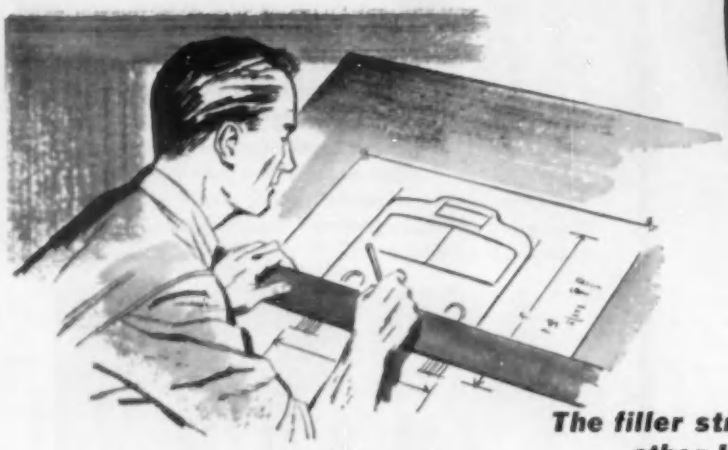
MICROMATIC HONE CORPORATION

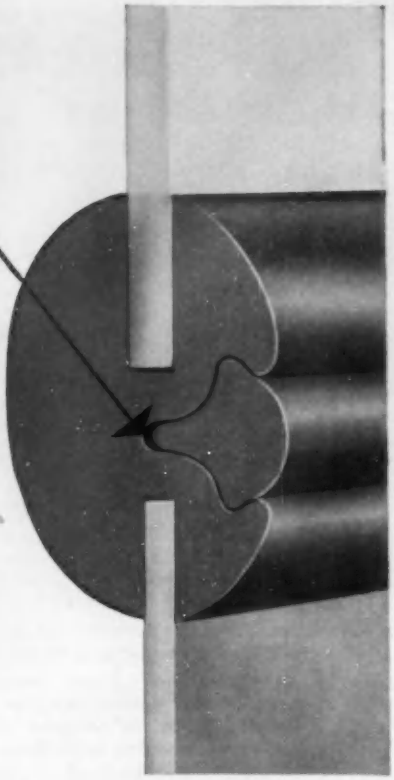
8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

It's this separate

FILLER STRIP

that puts more pressure on the fence and the glass . . . allowing new freedom of design!





The filler strip makes possible these other Inland advantages!

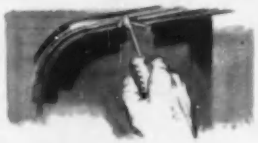
Today, weather stripping is a "snap". And, it's the snap of Inland's new weather strip that does it! Just think of the design freedom you have—now that weather strip problems are gone. With Inland Self-Sealing Weather Strip, *you need make no provisions for cement, clamps, moldings or channels. You are assured a water-tight seal every time!*

The patented Inland Filler Strip enables the installer to compress the sealing strip *after* the glass is in place. And because it eliminates all the headaches of trying to force the glass into a compressed groove, this is the easiest weather strip to install!

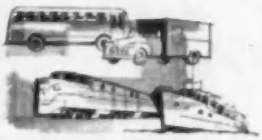
INLAND MANUFACTURING DIVISION
General Motors Corporation • Dayton, Ohio

LEAK PROOF! Permanently leak proof, because it seals both glass and body panel under powerful compression.

EASY GLASS REPLACEMENT! Less lost time for vehicles—broken glass can even be replaced on the road, if necessary.



A POSITIVE SEAL! New filler strip puts more pressure on the fence and the glass—assures complete positive weather proofing every time.



VERSATILITY! Ideal for vehicles, booths, trains, gasoline pumps, buildings, marine windows—for positive, permanent sealing of any window or panel!

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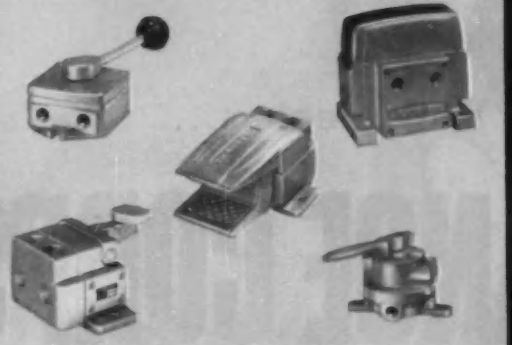
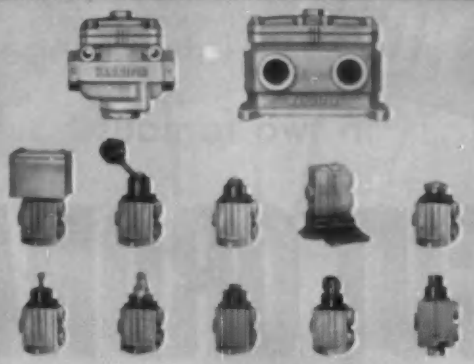
Self-Sealing

WEATHER STRIP

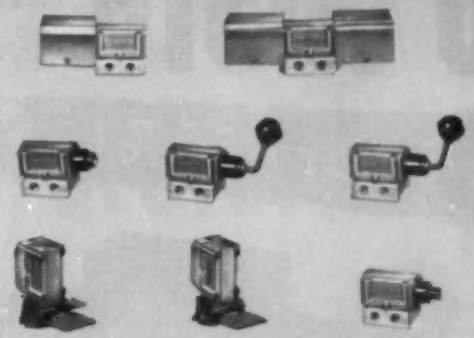
FOR AIR CYLINDER CONTROL... Manual or Electric



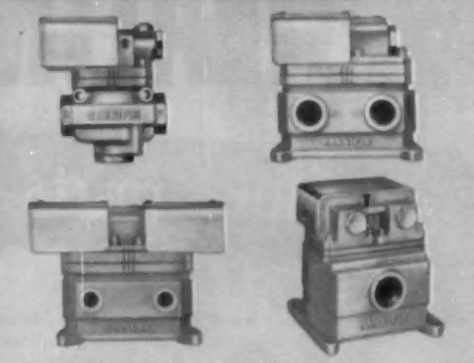
Hannifin Disc Valves. 3-way and 4-way, direct- or pilot-operated. For hand, foot or electric actuation.



Hannifin P-M Master Valves. 2-way, 3-way, 4-way. Remotely controlled from wide choice of Pilot Valves.



Hannifin P-M Direct-Operated 4-Way Valves. Small, compact, inexpensive. For every type operation.



Hannifin P-M Pilot-Master Valves. Solenoid controlled by integral pilot heads. 2-way, 3-way and 4-way.

HANNIFIN has the Air Control Valves for Your Specific Applications

Hannifin has the air control valves you need for use on your production lines or on the products you manufacture, often in a choice of types.

Shown here are typical valves from the extensive and complete Hannifin line. There's a Hannifin valve for every use from the simplest to the most complicated air-operated circuit. Singly or in combination, Hannifin valves provide hand, foot, cam, pressure or solenoid operation . . . in almost every pipe size.

You can simplify your air control valve problems by standardizing on Hannifin. Call in your Hannifin representative, who will discuss your valve requirements. Meanwhile, write for our complete Control Valves catalog.

WRITE FOR BULLETIN

Your copy of the complete Hannifin Control Valves catalog will be sent on request.

Stock Delivery on all types!

HANNIFIN

Hannifin Corporation, 543 S. Wolf Road, Des Plaines, Ill.

Air and Hydraulic Cylinders • Pneumatic and Hydraulic Presses • Riveters • Air Control Valves

NOW! interchangeable parts

in two famous South Wind heaters...

CUT ORDNANCE CORPS HEATING COSTS

...reduce parts inventory 50%!

Ordnance Corps Research and Development and South Wind have worked closely together in developing and testing vehicle heaters 1030D and 1060D. Now these heaters, besides meeting rigid military requirements, have interchangeable service parts that *reduce Ordnance Corps costs, cut parts inventory in half!*

Two Units—Two Output Capacities—Same Parts!

By stocking parts for one heater, you automatically stock parts for the other . . . cut part costs . . . reduce handling and stock control problems. It adds up to greater economy in vehicle heating. It's available to you now from South Wind!

Outstanding developments like this are the result of careful planning, expert engineering and precision manufacturing. Specify South Wind—maker of the famous heaters that cut costs and standardize parts for the Ordnance Corps! Application of these same South Wind skills can help solve *your* particular vehicle heating problem.

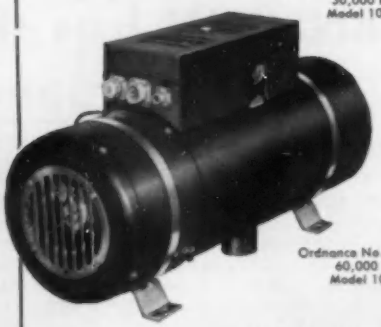
All three basic heating needs for vehicles —in ONE heater!

1. Engine Pre-heating. Makes starting easier, faster. Floods engine components—battery, crankcase, carburetor—with fresh, heated air.

2. Personnel Heating. Keeps personnel comfortable and at peak efficiency with fresh hot air, independent of engine heat.

3. Windshield Defrosting. Assures clear vision, safer driving. Keeps windshield "frost-free."

Ordnance No. 8720193
30,000 BTU
Model 1030D



Ordnance No. 8720194
60,000 BTU
Model 1060D

There's a South Wind Heater for every heating need

Do you have a heating problem? Write today for the experienced counsel of South Wind field engineers on any problem in internal or external pre-heating or space heating. The wide range of South Wind Heaters includes 20,000 —30,000—60,000—100,000—200,000 and 600,000 BTU/hr. capacities. Write South Wind Division, Stewart-Warner Corporation, 1514 Dover Street, Indianapolis 7, Indiana.

South Wind

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A PRODUCT OF SW STEWART-WARNER

Engine and Equipment Pre-heating
Windshield Defrosting
Personnel Heating

At your fingertips

and at real savings - small drawn parts by

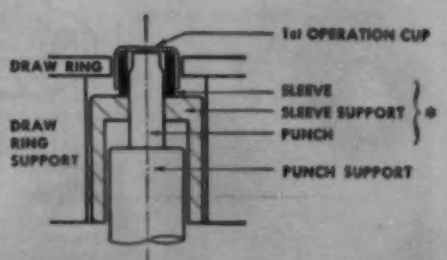
Hydroforming

Cincinnati 8" Hydroform

THE NEW CINCINNATI 8" HYDROFORM brings decided time and cost savings to manufacturers required to produce small, deep drawn and formed parts. Illustrated above is a typical example.

The photo shows, in sequence, the three Hydroforming operations to produce an electron tube component. Material is 0.020" O. F. H. C. copper. This part would have required five or six operations by conventional methods.

To illustrate the simplicity of Hydroform tooling, the diagram below, right, shows the redraw tools used in the second operation. The sleeve, sleeve support and punch were made of ordinary steel, turned on a lathe. The 1½" dia. x 1¼" deep 1st operation cup was simply placed on the sleeve and redrawn. Redraw tools for the final operation were similar and equally inexpensive.



*2nd Operation Redraw Tools

Parts from sheet materials up to ¼" steel, from blanks up to 8" in diameter, can be drawn on the 8" Hydroform. Maximum draw depth is 5". For larger work, Hydroform machines of 12", 19", 23", 26" and 32" capacities are available. Let a Cincinnati Milling field engineer give you detailed information on how you can profitably apply Hydroforming to your work. For a description of the process and specifications of the six machine sizes, write for Bulletin M-1908.

CINCINNATI **Hydroform**

PROCESS MACHINERY DIVISION

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

ELECTRUNITE SAVING 9¢ PER INCH

Clamp-type air and hydraulic cylinders made by Carter Controls, Lansing, Illinois, make many manufacturing operations automatic. Typical might be toggle operations, spring motion returns, die-set strippers, multiple holding and clamping.

One model of this low-cost, all-purpose cylinder delivers a two-inch stroke through a 2.4-inch steel air-cylinder body. For these bodies, Carter Controls had been using tubing made by a different method. A switch to Republic ELECTRUNITE® Electric Resistance Welded Tubing eliminated expensive ball sizing and burnishing for one thing. Since the ball sizing could only be done in short lengths, it was necessary to cut the tube prior to balling.

Now, Republic ELECTRUNITE Mechanical Tubing is purchased in long lengths and automatic screw machine production is practical.

The result of all this is that the air-cylinder body made of Republic ELECTRUNITE Steel Tubing shows a gross manufacturing saving of more than nine cents an inch!

Republic ELECTRUNITE Mechanical Tubing is consistently uniform in wall thickness, tolerances, roundness and surface finish. It is *precision* tubing on a production basis in every sense of the word, available in both carbon steel and in stainless steel analyses.

Write Republic your problem in any tubular or cylindrical part. Let's see where we can help you save . . . pennies or dollars.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
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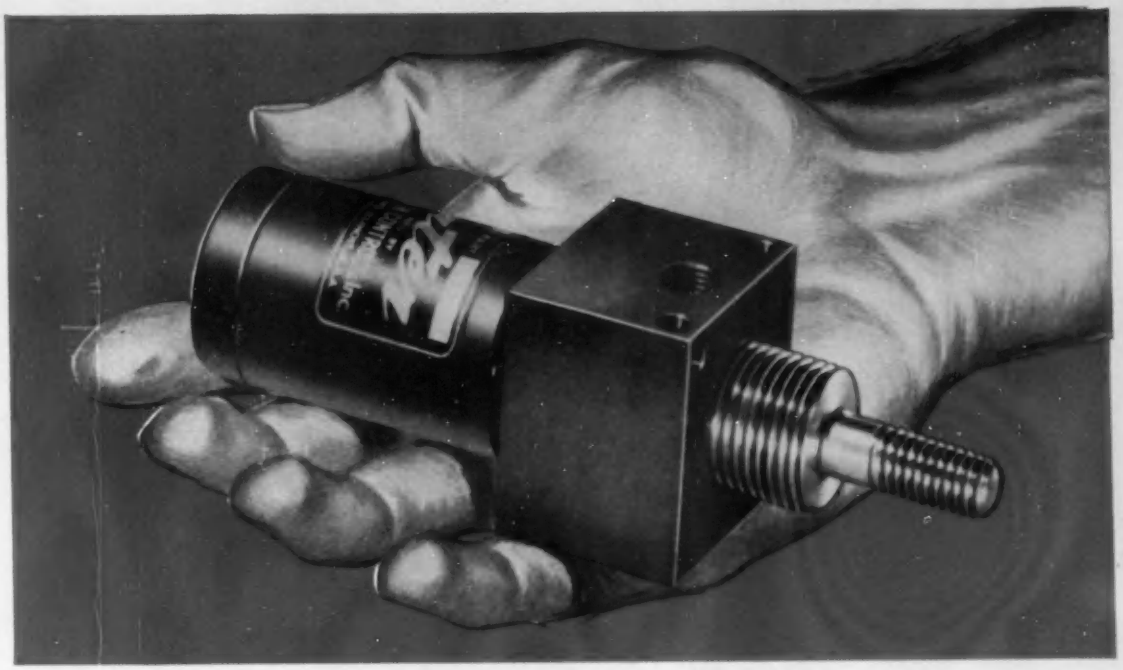
Cleveland 27, Ohio

Saving money interests me.
Send facts showing how your products can help.

☐ ELECTRUNITE Steel Tubing
☐ Republic Cold Drawn Carbon Corrected Bars
☐ Republic Electro Paintlok
☐ Republic ENDURO® Stainless Steel

Name _____ Title _____
Firm _____
Address _____
City _____ Zone ____ State _____

COSTS CUT 8%. That's the result of using Republic Electro Paintlok for these traveling poster frames, manufactured by The Yarder Manufacturing Co., Toledo, Ohio. Electro Paintlok is Republic's zinc-coated sheet steel that's chemically treated to take paints, lacquers and synthetic enamels . . . and to hold them for years. It cuts pre-paint cleaning and degreasing costs, welds readily, is easy to fabricate. If you paint on steel, write for facts about Republic Electro Paintlok.

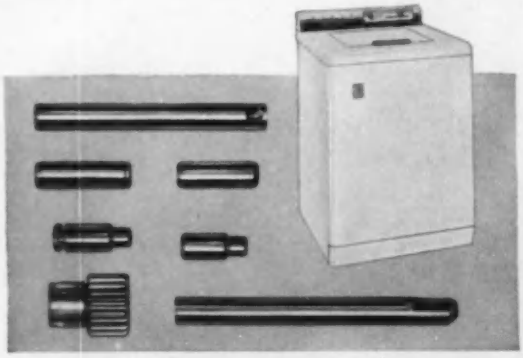


THE OLD WAY

1. Cut to length.
2. Size and burnish inside surface by pressing ball through tube.
3. Thread short lengths which are subject to distortion.
4. Cost ratio: 214

THE ELECTRUNITE WAY

1. Feed long lengths of precision ELECTRUNITE Tubing into automatic screw machine; roundness is unaffected by cutoff and threading.
2. Cost ratio: 100



NORGE REDUCED COSTS 16% on automatic-washer parts. They did it by switching to Republic Cold Drawn Carbon Corrected Steel, and eliminated costly carburizing operation. Machinability is good and quality of the parts improved. Republic's carbon correction restores carbon lost during hot rolling, restores it right out to the edge of the bar. No need to buy oversize bars to allow for surface removal. Norge saves both metal and money. You can, too. Write Republic.

HERE, REPUBLIC ENDURO STAINLESS STEEL DIDN'T SAVE, IT EARNED! Wouldn't you spend $9 to make $40? Flxible Manufacturing Company did just that when it switched to Republic ENDURO Stainless Steel as the material for public rental lockers. Compared with previous costs for painted lockers, ENDURO cost about 9% more. But, the bright, attractive stainless steel attracts 25% to 40% added revenue. ENDURO is bright, attractive, easy to care for. You can't wear it out. Neither can high traffic locations. Republic will help you apply it advantageously, economically. Send coupon.

A Method . .

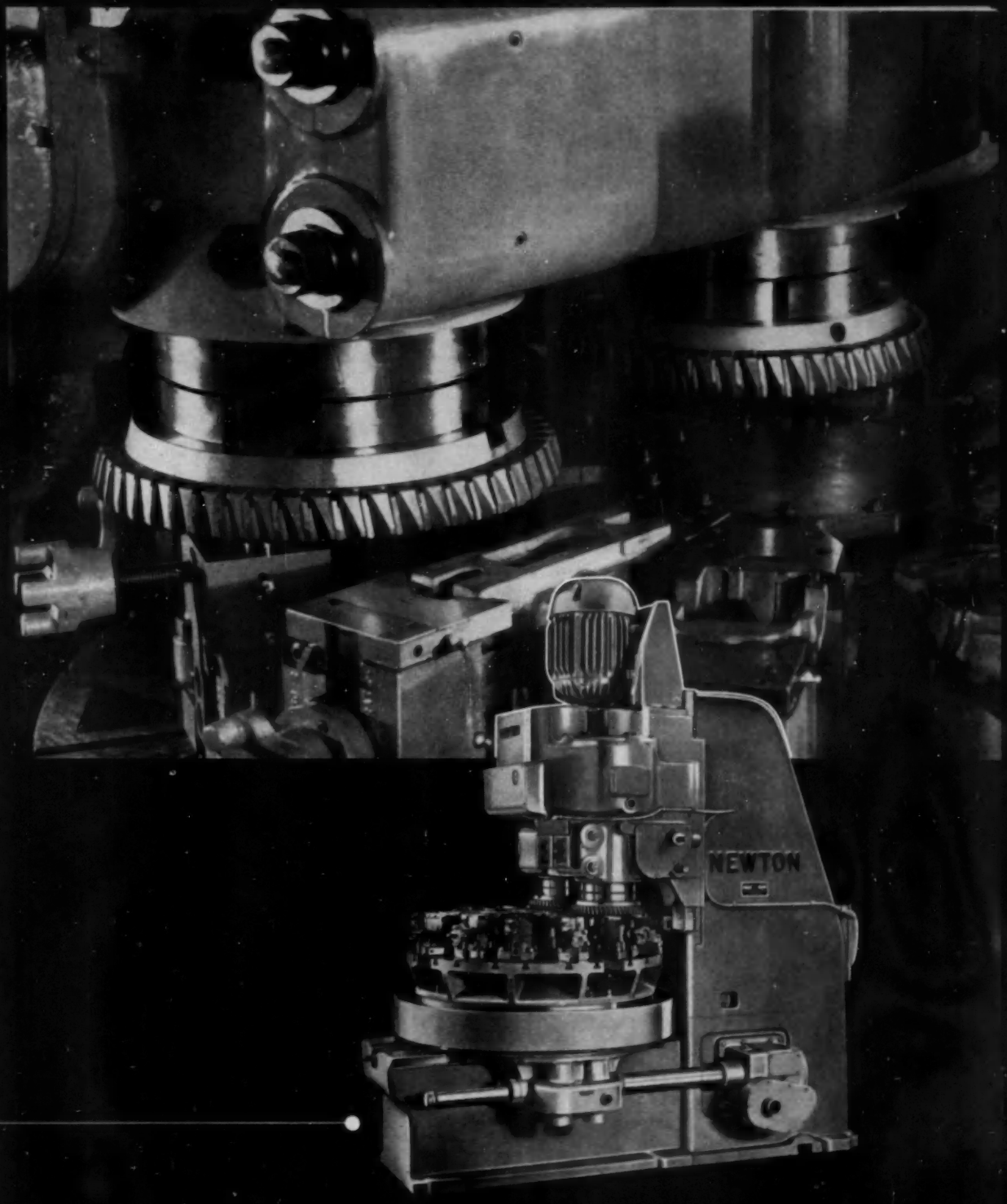
A Newton Vertical Rotary is more than a machine tool—it is a method—the *fastest known method* of milling the flat surfaces of repetitive pieces.

It is fastest because these machines mill continuously!

CONSOLIDATED MACHINE TOOLS FJB

CONSOLIDATED MACHINE

A DIVISION OF FARREL-



TOOL COMPANY ROCHESTER 10, NEW YORK

BIRMINGHAM CO., INC.

To help improve induction heating applications, Lindberg engineers have spent two years developing equipment for M-G set frequencies of 1 kc., 3 kc. and 10 kc. This equipment is now available to you.

This development has also produced many advanced design features that are incorporated in control and heating stations used in connection with motor generator equipment.

Generators are available in power outputs from 30 kw. to 1250 kw.

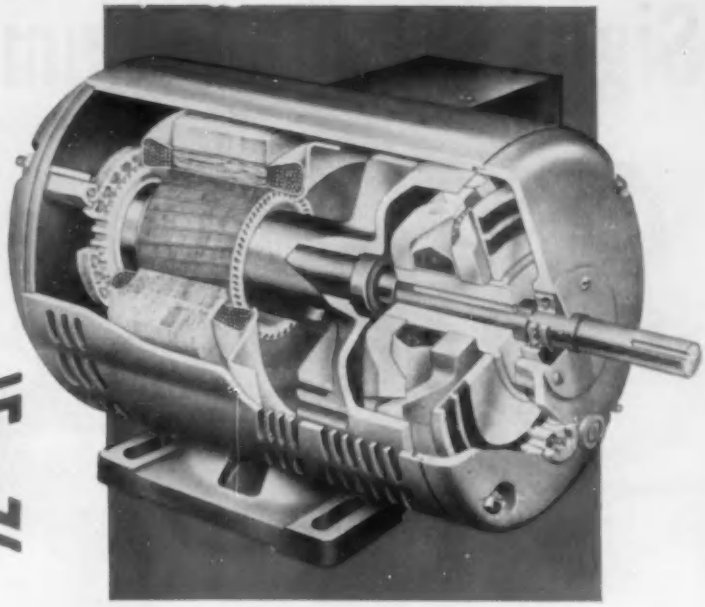
Lindberg engineers are now equipped to solve your metal heating problems using optimum frequencies for specific applications from 60 cycles upwards. For information consult your nearest Lindberg field office or write for Bulletin No. 1460.

The High Frequency Division of Lindberg Engineering Company announces a complete line of MOTOR GENERATOR EQUIPMENT for all Induction Heating Applications

HIGH FREQUENCY DIVISION
Lindberg Engineering Company
2491 W. Hubbard St., Chicago 12, Illinois

EATON

DYNAMATIC®



Stepless Adjustable Speed from an AC Power Source with Dynamatic Fractional HP Ajusto-Spede® Drives

These famous Ajusto-Spedes®—available in sizes ranging from ¼ HP to 75 HP—provide the solution to many drive problems at surprisingly low cost.

Fractional HP Ajusto-Spedes® are compact, self-contained units, an integral combination of AC constant speed induction motor, eddy current coupling, and electronic control.

All fractional horsepower Ajusto-Spedes® are rated 115/220 volts, single phase or 220/440 volts, 3 phase. Sizes are ¼, 1/3, and ½ horsepower at 1600 RPM; ½ and ¾ horsepower at 3200 RPM.

Write for your copy of the Dynamatic Ajusto-Spede® Bulletin FAS-4

Ajusto-Spede® Advantages:

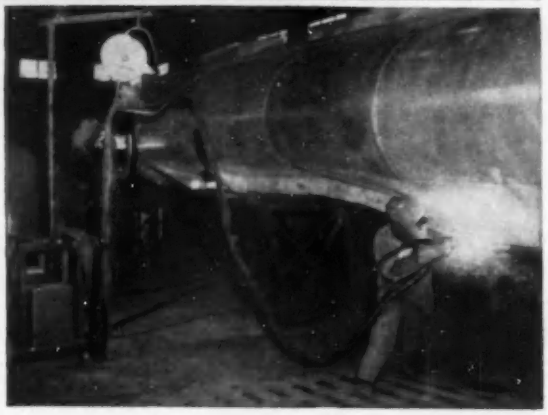
- ★ Constant torque speed range: 25 to 1 with 1600 RPM and 3200 RPM Ajusto-Spedes®.
- ★ Control accuracy: 2 per cent of top speed at any point within the speed range.
- ★ Minimum wiring to power line.
- ★ Remote "one knob" control operation up to 100 feet.
- ★ Rugged plug-in type integral one-tube electronic control.
- ★ Permanently sealed grease-packed bearings.
- ★ Power output shaft extension at both ends of drive.

EATON

DYNAMATIC DIVISION
MANUFACTURING COMPANY
3307 FOURTEENTH AVENUE • KENOSHA, WISCONSIN

Sigma Welded Aluminum Tanks

—WEIGH LESS
—CARRY MORE
—LAST LONGER



The problem of how to get bigger pay-loads in truck trailers and semi-trailers was solved by one manufacturer who converted to weight-saving aluminum and sigma welding . . . These giant semi-trailer tanks hold 7,950 gal.—700 gal. more than similar tanks made of steel.

The high quality of sigma welded aluminum has increased tank resistance to corrosion. Sigma welding has also eliminated expensive weld cleaning—welds need only a light grinding and they are finished. Each semi-trailer requires about 1,100 linear ft. of sound sigma welding. The new high-strength, ductile alloys used range in thickness from 3/32 to ½ inch.

Like many other products throughout industry, these trailers are being fabricated with new quality and efficiency using sigma welding.

Here are some features of sigma welding—

- Uses any d.c. or constant potential power supply. With c.p. voltage is held constant—welding operations are fast and more efficient.
- Makes smooth welds in joints of all types—on all commercially welded metals . . . joins metals up to ¼ in. thick in one pass.
- Sigma welding speeds exceed 100 in. per min. in many operations. Start saving now, call your local LINDE representative for more information—and ask for Form 7942 "Modern Methods of Joining Metals."

Linde Air Products Company
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30 East 42nd Street UCC New York 17, N. Y.
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Division of Union Carbide Canada Limited, Toronto
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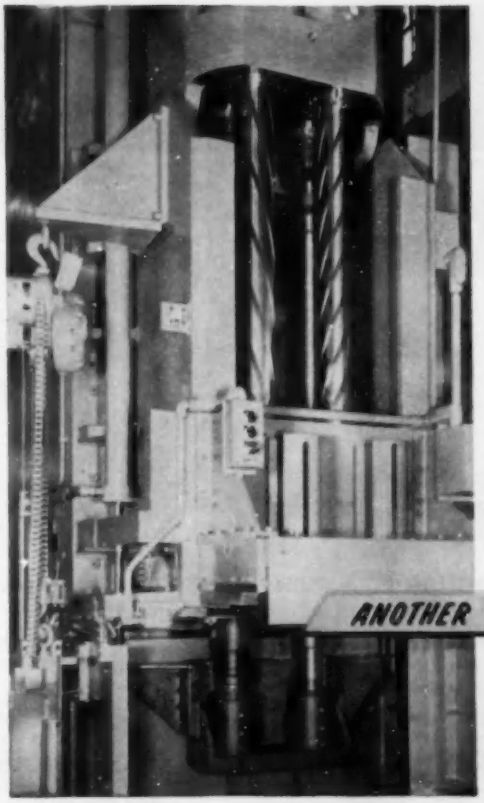
Linde
Trade-Mark

QUALITY GEARS for QUIET TRANSMISSIONS



...broached automatically

Producing quality internal helical gear teeth is the task of two Colonial 2-station RUF-50-72 pull-up broaching machines. All gears are automatically loaded from cartridges and automatically unloaded, with the larger diameter gears being broached two at a time on each station. These quiet transmission gears with three different leads and diameters, have two left hand and one right hand spiral. All three different gears may be broached as production demands on either of the two stations.

Broaches are guided on both ends through full length of cut; broach handling is automatic with safety interlock. Colonial broaches for these gears weigh as much as 800 pounds, and are 81 inches long. Broaches return through a retractable brush and a pressure spray washes chips away. An electric hoist mounted on a universal loading arm handles these broaches in and out of the machine. A cooler for cutting oil, a magnetic chip separator, and an automatic chip conveyor are also furnished on these two Colonial pull-ups.

ANOTHER EXAMPLE OF COLONIAL UNIFIED BROACHING

COLONIAL
BROACH & MACHINE CO.
DETROIT 13, MICH.

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BENDIX LINKAGE TYPE POWER STEERING—Because Bendix* Power Steering is of the linkage type, manufacturers find it especially adaptable for production line installation without extensive engineering changes. Manufacturers can now meet the ever-increasing demand for power steering more efficiently and more economically with Bendix Linkage Type Power Steering.

BENDIX LOW PEDAL POWER BRAKE—Specified by more car manufacturers than any other make, Bendix* Low Pedal Power Brake makes possible quick, sure stops by merely pivoting the foot from the go to the stop control. No need to lift the foot and exert leg power to bring the car to a stop. Result—more driving comfort, less fatigue and greater safety.

*REG. U. S. PAT. OFF.

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High Spots of This Issue

Aircraft Production Highlight of SAE Meeting

The theme of SAE's Aeronautic forum held recently in Los Angeles was to closely coordinate engineering and manufacturing for better production planning and problem solving. The subjects discussed are abstracted here. Page 52.

London and Paris Automobile Shows

The International Motor Show in London was the occasion for judging how British industry stacks up against international competition. Page 54. Latest developments shown at the Paris Automobile Show are described separately. Page 60.

Studebaker and Nash Models for 1956

Studebaker has added a full line of sports cars in its new series, in addition to revamping the styling of conventional models, Page 58. Nash is offering four engine horsepower ratings, and four transmission alternates. Page 62.

Plymouth's Automatic Engine Assembly and Testing

The Plymouth V-8 engine manufacturing plant in northeast Detroit introduces many new production methods. So comprehensive is the subject that this article, one of a series, is confined to some of the "firsts." Page 64.

Automatic Production of Dynaflow Pump Covers

For producing Dynaflow pump covers, Buick engineers have devised an integrated press transfer line, incorporating ingenious automatic feeding and unloading. How this was accomplished is detailed starting on Page 70.

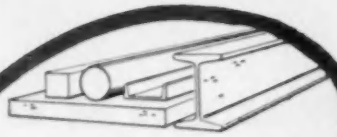
40 New Product Items And Other High Spots, Such As:

Automotive equipment analyzed at Hydraulics Conference; facts about sale of Ford stock; AGMA meeting; Saginaw introduces integral power steering gear; NMTBA Meeting; forecast of 1955 motor vehicle registrations; Metal Show review; machining of integral stiffened spars; and forged aluminum equalizer beam saves weight.

Complete Table of Contents, Page 3
Automotive and Aviation News, Page 37

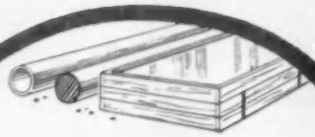
AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY • PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT

call Ryerson for steel



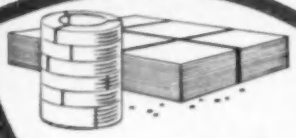
CARBON STEELS

Hot rolled and cold finished bars; channels, angles, beams, etc.; plates of every kind.



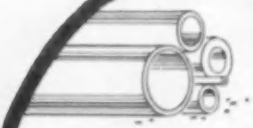
STAINLESS STEELS

World's largest stock of sheets, plates, bars, pipe, tubing, fittings, etc.



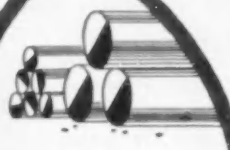
SHEET AND STRIP

Over 20 kinds and many gauges—in pattern sizes or cut to your order.



TUBING

Mechanical and pump cylinder tubing, seamless and welded; hydraulic fluid line and boiler tubes; structural tubing, etc



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Tested alloys of known hardenability, standard and aircraft quality, as rolled, annealed, heat treated.

Quick delivery from nation's largest stocks

Need steel in a hurry? Ryerson stocks are the nation's largest, so one call to your nearby Ryerson plant brings quick delivery of almost any kind of steel in almost any quantity—all of it certified for high uniform quality.

Do you want your steel prepared for immediate use? Ryerson facilities include the most modern close-tolerance equipment for sawing, shearing and flame cutting to your specifications.

Of course, current heavy demand makes it difficult to keep all sizes always on hand but our stocks are being replenished continuously. Steel that's out of stock today may be in stock tomorrow. And experienced Ryerson steel men will help you make the most of steel on hand. So for everything in steel and steel service . . . call Ryerson.

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News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 113, No. 10 November 15, 1955

Packard, Clipper Cars Priced $63 to $270 Above '55 Models

Packard and Clipper cars are priced from $63 to $270 above comparable 1955 models. The smallest increase has been made on the Packard Caribbean convertible, while the largest has been applied to the Packard Patrician four-door sedan.

The Ultramatic automatic transmission, standard on the Packard and optional on the Clipper, remains priced at $199, but the push-button feature costs an additional $52. Both the Ultramatic and the push-button console are standard on only the two highest-priced Caribbean models. The new non-slip differential, offered as extra equipment on all models, carries a suggested list price of $44, excluding taxes.

PACKARD, CLIPPER PRICES*

Packard	1956	1955
Patrician Four-Door Sedan	$4,160	$3,890
400 Hardtop	4,190	3,930
Caribbean Convertible	5,995	5,932
Caribbean Hardtop	5,495	†
Clipper		
Deluxe Four-Door Sedan	2,721	2,586
Super Four-Door Sedan	2,866	2,686
Super Panama Hardtop	2,916	2,776
Custom Four-Door Sedan	3,069	2,926
Custom Constellation Hardtop	3,164	3,076

* Advertised delivered prices, including excise taxes and delivery and handling charges.

† Not offered.

National Fibres Shows $1.5 Million Profit

National Automotive Fibres, Inc., had a good year so far, its nine-month report shows. Net profit for the period ended Sept. 30 totaled $1.5 million. Last year, during the same period, the company suffered a loss of $326,141 on sales of $41.6 million. Sales this year climbed to $60.4 million.

DO-IT-YOURSELF SPORTS CAR BODY OF PLASTIC

U.S. Fiberglass Co., Inc., is manufacturing a sports car body of glass fiber reinforced plastic that it claims can be mounted with little modification by using home workshop tools for the most part. Called the U.S. Mark II, the body can be fitted to any car with a wheelbase of 110 to 118 in., such as 1949-51 Chevrolets, Fords and Plymouths, the company states.

GM Earnings Hit Record $913 Million In 9 Months

General Motors' earnings for the first nine months totaled $913 million on sales of more than $9½ billion. The all-time high net for nine months was approximately $328 million higher than in the comparable period last year when sales totaled $7.2 billion.

GM car and truck sales totaled 3.6 million units, more than one million above last year, with the total far surpassing the corporation's entire 1953 output. Operations at GM's overseas manufacturing plants have continued at peak levels, with factory sales for the first nine months recorded at 281,647 units, 11 per cent above the comparable period last year.

On the other hand, defense sales dropped considerably, accounting for only 8 per cent of total sales. In the nine-month period, government work totaled $738 million, 30 per cent under last year, with sales of $181 million during the third quarter at the lowest quarterly volume since the second quarter of 1951.

Volume of receivables purchased was 47 per cent higher than the first nine months last year, totaling $7.66 billion against $5.22 billion. Receivables outstanding at September 30, before deducting unearned income and loss reserves, amounted to $3.6 billion, an increase of 39 per cent over last year.

During the first nine months, GM's worldwide employment averaged 621,958 persons and payrolls totaled $2.3 billion, compared with an average employment of 577,069 and payrolls of $1.9 billion last year. Overtime operations at GM plants increased the average work week to 42.7 hours from 39.9 hours a year ago, and average weekly earnings to $102 from $89.95.

King-Seeley To Construct Addition To Its Plant

King-Seeley Co. is planning to construct a 45,000 sq ft addition to its Scio, Mich., plant. In addition to some defense work, the plant has been making products for the appliance and automotive industries.

News of the AUTOMOTIVE

HARDTOP STYLING ADOPTED IN FUNERAL COACH LINE

Recently introduced by Superior Coach Corp. is the new Beau Monde hardtop funeral model. Built on a Cadillac chassis, it follows closely the same hardtop styling found on Cadillac hardtop passenger cars.

Marvel Engineering Co. Moves Into New and Modern Facility

Marvel Engineering Co., designers and manufacturers of Marvel Synclinal filters, have moved to their own, recently completed plant at 7227 N. Hamlin Ave., Chicago 15, Ill. The modern one-story building has been planned to allow for further expansion when necessary.

Enlarged designing and engineering departments are fully equipped and staffed to facilitate the company's constant research for the improvement of filtration of hydraulic oils and other liquids in low-pressure circulating systems. W. F. Dollinger, Jr., Marvel president and founder, states that the need for larger quarters was prompted by a continued increase in demand for the company's filters.

Another New Parts Plant To Be Erected By Ford

Parts manufacturing operations of Ford Motor Co. at Manchester and Milford, Mich., will be transferred to a new 600,000 sq ft plant to be built four miles southeast of Ypsilanti, Mich., headquarters of the Parts and Equipment Manufacturing Div. The new plant will produce instrument clusters and carburetors, now made at Manchester and Milford, and other parts and accessories, which Ford declined to name at this time.

To be located on a 90-acre site, the new facility, to be known as the Rawsonville plant, is scheduled to be completed by summer of 1957. Some production, however, is expected to be started by late 1956 in a portion of the plant. The plant will employ more than 1500, and present plans call for doubling that number to 3000 by the end of 1958.

Buick, Olds and Cadillac Hike 1956 Model Prices

While the prices announced so far have been increased an average of five per cent across the board, prices on two 1956 models actually have been reduced. The price cut was made by Buick on its two station wagons offered in the Special and Century series, chopped $226 and $169 respectively, indication that Buick is definitely determined to cut itself a larger slice of the station wagon market. Buick, however, jacked up price tags on all other models.

Price lists revealed by three GM divisions show increases ranging from $33 on one Buick model to a whopping $300 on one model in the Cadillac 75 Series, GM's highest-priced car. Oldsmobile's boosts range from $45 to around $100. Chevrolet and Pontiac announced their prices earlier.

Dynaflow transmission and deluxe wheel covers have been made standard equipment on all 1956 Buick Century and Super models, while Olds has made its automatic transmission standard on its highest-priced 98 Series. Cadillac has made power brakes standard on all models, while Olds now offers power steering as a no-extra-cost item on the 98 Series. Both Cadillac and Olds reduced the price of air conditioning $75 and $150 respectively.

BUICK PRICES*

	1956	1955
Special		
Four-door Sedan	$2,166	$2,090
Four-door Riviera Sedan	2,270	2,195
Two-door Convertible	2,467	2,369
Two-door Riviera Coupe	2,204	2,128
Two-door Sedan	2,111	2,035
Four-door Estate Wagon	2,500	2,726
Century		
Four-door Riviera Sedan	2,717	2,684
Two-door Conv. Coupe	2,979	2,929
Two-door Riviera Coupe	2,660	2,566
Four-door Estate Wagon	2,932	3,101
Super		
Four-door Sedan	2,927	2,823
Four-door Riviera Sedan	3,010	†
Two-door Convertible	3,200	3,147
Two-door Riviera Coupe	2,884	2,780
Roadmaster		
Four-door Sedan	3,148	3,047
Four-door Riviera Sedan	3,324	†
Two-door Convertible	3,335	3,234
Two-door Riviera Coupe	3,230	3,144

OLDSMOBILE PRICES*

	1956	1955
Series "88"		
Two-door Sedan	$2,166	$2,091
Four-door Sedan	2,226	2,152
Holiday Coupe	2,330	2,255
Holiday Sedan	2,397	2,322
Super "88"		
Two-door Sedan	2,301	2,215
Four-door Sedan	2,383	2,278
Holiday Coupe	2,520	2,474
Convertible	2,726	2,641
Holiday Sedan	2,586	2,541
Series "98"		
Four-door Sedan	2,969	2,869
Deluxe Holiday Coupe	3,138	3,088
Starfire Convertible	3,380	3,280
Deluxe Holiday Sedan	3,204	3,154

CADILLAC PRICES*

	1956	1955
Series "62"		
Coupe	$3,814	$3,569
Sedan	3,902	3,658
Coupe de Ville	4,210	3,964
Sedan de Ville	4,330	†
Convertible	4,342	4,097
Eldorado Seville	6,014	†
Eldorado Biarritz Conv.	6,014	5,813
Series "60"		
Sedan	$4,587	$4,342
Series "75"		
Fleetwood Sedan	6,040	5,695
Fleetwood Imperial Sedan	6,240	5,895

* List prices, excluding Federal, state and local taxes, and distribution and handling charges. Prices include equipment which is specified as "standard" on certain models.

† Not offered.

AND AVIATION INDUSTRIES

Ford Expects Profits To Top 21 Pre-War Years Combined

Ford Motor Co. expects its earnings this year to surpass total earnings of the entire 21 years prior to World War II. Profits for the first nine months, both before and after taxes, already have topped any total year's profit, according to Ernest R. Breech, board chairman.

A hint as to profits as of Dec. 31, 1954, is contained in the company's annual balance sheet, filed with the Massachusetts Tax Commission and released recently. The statement shows that $144,250,000 was added to surplus. This stood at a record $1,065,584,000 at the year-end, compared with $921,334,000 at the end of the preceding year. Ford's assets at last year-end totaled more than $2 billion.

It is always interesting to reflect on the growth of the Ford company. Its financial growth always has held much attention, but never so much as in recent years, and the report by Breech has heightened interest. In 1946 the company's loss totaled a gigantic $51.6 million during the first three quarters. Ford held only 22 per cent of the total automobile market then. The company ended that year with a small loss, but came back the following year in the black, where it has remained since.

Ford faced the post-war market with rundown plants. Today the company estimates that 95 per cent of its facilities are either new or have been modernized since 1946. When present projects are completed, Ford will have added 67 manufacturing plants and other buildings. Of a total of 99 plants and buildings, more than two-thirds will have been built or acquired in the post war period. They include 20 components manufacturing plants, 13 assembly plants, 20 parts depots, 11 engineering and research buildings and three office buildings.

Today Ford's U. S. employment totals more than 193,000, an increase of more than 55 per cent over the 1946 figure. According to latest figures released by Ford, hourly rated employes worked an average of 44.1 hours per week, receiving an average weekly pay of $105.74. The overtime work is reflected in production totals. Ford's output of vehicles for the first 10 months this year surpassed any previous full-year output, totaling 2,147,140, compared with 1,618,975 last year.

CLARK-ROSS CARRIER OFFERS TWO ENGINE CHOICES

Syncromesh transmission, full hydraulic control of load hooks, and radi-arc steering are features of this redesigned straddle carrier introduced by Ross Carrier Div. of Clark Equipment Co. The Series 71 machine has a rated capacity of 10,000 lb and replaces the previous Model Series 70. Purchasers may specify either a Ford 130-hp engine or a Hercules 91-hp engine, both gas or LPG-powered.

Goodyear Hikes Tire Prices; Others Expected To Follow

Tire prices continue to shoot upward. Goodyear Tire & Rubber Co. last month set the pattern for the fifth price boost in the tire industry in less than a year, with the announcement that its prices were going up from 1½ per cent to 5 per cent. The smaller increase applies to non-tubeless passenger, farm, implement and pneumatic tires, while the larger one includes truck tires. The new price hikes do not include tubeless tires, since they were raised considerably in August.

Most other tire producers have followed the price pattern set by Goodyear. Natural rubber prices now are up more than double a year ago, and recent wage boosts also are contributing to the cost squeeze. The total increase since last year amounts to more than 15 per cent on passenger car and 23 per cent on truck tires.

Motor Wheel Nearly Doubled Its Earnings

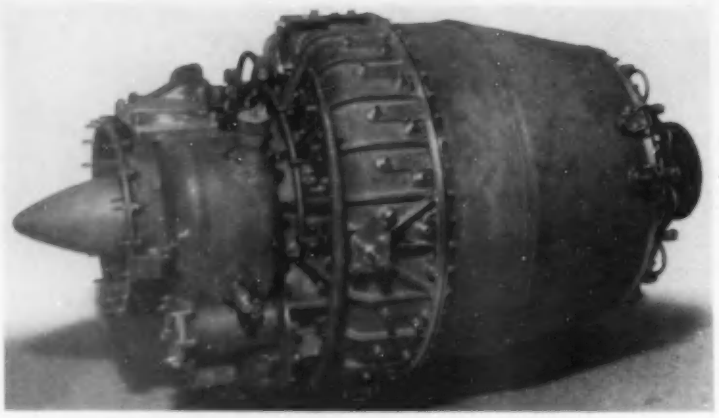
The nine-month report of Motor Wheel Corp. shows net earnings totaled $2.1 million, substantially higher than earnings during the comparable 1954 period, when they totaled $1.2 million. Sales also climbed considerably, totaling $59.3 million, compared with $40.6 million last year.

GM Builds 7 Millionth Automatic Transmission

Although the Detroit Transmission Div. has been in existence only a little more than 15 years, it has produced more than one Hydra-Matic transmission for every 10 cars built by General Motors, which produced its first car nearly 50 years ago. This was brought out in a report from GM stating that Detroit Transmission produced its 7 millionth Hydra-Matic on Nov. 4, illustrating the great demand for automatic transmissions.

It is interesting to note how tremendously the demand for automatic transmissions has increased in just the last few years. One-third of the total Hydra-Matics built by the GM division were produced in the last two-year period.

News of the AUTOMOTIVE



FIAT GAS TURBINE DESIGNED FOR AIRCRAFT USE

This Fiat gas turbine is said to be the first of its kind to be designed and produced in Italy. Designated the Model 4002, it has a thrust of 550 lb and is intended for aviation service.

Federal-Mogul-Bower Net Up 32% For Nine Months

Nine-month sales of the newly formed Federal - Mogul - Bower Bearings, Inc., were 23 per cent higher than the totals of its predecessor companies in the like 1954 period, totaling $64 million compared with $52 million last year. The net in the same period climbed by 32 per cent from $4.4 million to $5.8 million, and excluded profits between Federal-Mogul and Bower, which merged last July.

Douglas Awarded $175 Million Jet Transport Order by United

United Air Lines has placed a $175 million order with Douglas Aircraft Co. for 30 DC-8 jet airliners and spare parts. It is the largest such order yet placed with any single aircraft manufacturer.

Delivery of the 112-140 passenger aircraft will begin in May, 1959. United expects to inaugurate jet service between principal cities on its 13,250-mile system by November, 1959.

The DC-8 will be powered by four Pratt & Whitney J-57 engines, each capable of more than 10,000 lb of thrust. A thrust-reversing mechanism will shorten landing distances and serve as an additional runway brake.

The United order followed closely on the heels of a $269 million jet plane order by Pan American World Airways—split $100 million for Boeing Airplane Co. and $169 million for Douglas Aircraft Co. (See AI, Nov. 1, p. 104.) The new DC-8 order raises Douglas' backlog of civilian orders to $785 million.

50 Per Cent Output Boost Planned By Olds For '56

Oldsmobile will add more than 900 new machine tools and other manufacturing equipment at Lansing under a multi-million-dollar expansion program which will boost productive capacity by 50 per cent. No new building construction is planned. The machines will be installed in a building formerly used for manufacture of military equipment, such as bazookas, jet engine assemblies, and cannons, under contracts which now are expiring.

The division has set its sights on a market of 750,000 cars in 1956, and feels confident it can hit that goal once productive capacity is expanded at the Lansing plant. At a recent press preview of the 1956 cars in Lansing, J. F. Wolfram, Olds' general manager, made some interesting comparisons between prices and "values" of the 1950 Olds 88 Holiday Coupe and a comparable 1956 model.

The difference in price between the $2330 price tag on the 1956 model and the comparable 1950 model is just $17, Wolfram estimated. His calculations are based on adjustment of the dollar to the cost-of-living index, which has risen 12½ per cent in the last five years. Ignoring the cost-of-living adjustments, the difference in price between the two models would actually be $257 higher in today's dollar value. Comparing values of the two models, Wolfram made the following observations:

OLDS MODEL COMPARISON

"88" Holiday Coupe	1950	1956
Shipping weight	3,540 lb	3,761 lb.
Wheelbase	119½ in.	122 in.
Overall length	202 in.	203.29 in.
Overall width	75 3/16 in.	78⅝ in.
Height	62½ in.	60½ in.
Front seat leg room	42.6 in.	44.4 in.
Rear seat leg room	36.4 in.	42.5 in.
Horsepower	135	230
Torque	262 lb-ft	340 lb-ft
Compression ratio	7.25 to 1	9.25 to 1
Piston displacement	303.73	324.31
Trunk space	10.46 cu ft	11.5 cu ft
Voltage system	6-volt	12-volt
Windshield	1 piece	panoramic

Checker Cab To Build Dual Purpose Vehicle

Checker Cab Manufacturing Co. is entering the passenger car business on a very limited scale. It will start building in December a smaller taxicab which can easily be converted into a private passenger car. It will be powered by a 226 cu in. six-cylinder L-head Continental engine, and have 120 in. wheelbase, overall length of 200 in., and more headroom than any of the Big Three. It will be a plain model with no chrome, and will be built for ruggedness, long life, and low upkeep.

The standard model with manual shift will sell for $1805. A special model with automatic drive, power brakes, power steering, two jump seats, and a back window that can be raised electrically from the driver's seat to a 45 degree angle, will sell for $2206. Checker plans no dealer body and will sell direct from the factory. Prices are F.O.B. Kalamazoo.

AND AVIATION INDUSTRIES

ELECTRONIC TICKETS

Ticket sales agent inserts "destination plate" to actuate reply from "Unisel," newly invented device which reports space available on United Air Lines' flights. Instant response from central electronic brain comes in form of lights glowing under one or more of eight indicators, each representing a flight. The device was developed for the company by Teleregister Corp.

Chevrolet Buys Another Plant in Toledo

Chevrolet has announced the purchase of the Martin-Parry Corp. plant in Toledo and adjacent property, to supplement present automatic transmission production. It is understood that Chevrolet had offered in the neighborhood of $4.5 million for the 500,000 sq ft plant, which Martin-Parry bought from the Government for $1 million in 1947. The facility is located on a 75-acre site, and is comprised of a one-story manufacturing building and a two-story office building. It will employ between 2000 and 2500 when in full operation about Jan., 1957.

Chevrolet is expanding its facilities considerably, and undoubtedly needed additional space for making automatic transmissions to match increasing car output. The division is looking forward to a 3-million-a-year car output "in the foreseeable future."

The Chevrolet division is now producing all of its automatic transmissions in a plant near Cleveland. It also has another plant in Toledo for manufacture of truck transmissions.

AI TABLOID

Kaiser Aluminum & Chemical Corp. is undertaking a $90 million expansion program involving five of its manufacturing plants. . . . Harvey Aluminum has launched an intensified press forging development program.

* * *

Scintilla Div. of Bendix Aviation Corp. expects to complete its $2 million expansion program by the end of this year.

* * *

Cornell Aeronautical Laboratory has announced that it will attempt to design a futuristic "crash-proof" car.

* * *

General Tire & Rubber Co. is said to be planning a merger of Respro, Inc., into its plastics operations.

* * *

Oster Mfg. Co. will enter the material handling equipment field on Jan. 1 with a line of portable lifts with capacities up to 2000 lb.

* * *

Du Pont Co. has announced reductions in the price of titanium metal sponge and improved quality specifications for top grade material.

* * *

Shakeproof Div. of Illinois Tool Works is constructing an addition to its Elgin, Ill., plant . . . Bristol Engineering Corp. has added 33,000 sq ft in a new expansion program.

* * *

Goodrich-Gulf Chemicals, Inc., will construct a pilot plant for the production of man-made rubber which duplicates tree rubber at Avon Lake, O.

* * *

American Airlines is planning to place an order shortly for 30 jet airliners costing about $135 million.

All American Engineering Co. has disclosed an idea for a flying submarine equipped with water skis.

* * *

Jones & Laughlin Steel Corp. dedicated its new $1.5 million research laboratory at Pittsburgh, Pa., on Oct. 28 . . . Universal Oil Products Co. dedicated its new research laboratory at Des Plaines, Ill., on Oct. 28.

* * *

Dow Furnace Co. has announced completion of a building program doubling its production area.

* * *

Consolidated Vacuum Corp., subsidiary of Consolidated Engineering Corp., has been merged with the parent organization. It will be known as the ConVac Div. of Consolidated.

* * *

Vanadium Corp. of America will build a new plant in Ohio to produce ferroalloys . . . Kellet Aircraft Corp. has announced plans to occupy new production and office facilities in a plant to be erected at North Philadelphia Airport.

* * *

National Aeronautical Corp. has made plans to build a new plant with a potential annual capacity of $15 million near Ambler, Pa.

* * *

U. S. Industries, Inc., has acquired the assets of Southern Pipe & Casing Co.

* * *

Ford Div. of Ford Motor Co. dedicated its new 1.5 million sq ft assembly plant at Louisville, Ky., on Oct. 18. . . . Parker-Kalon Div. of General American Transportation Corp. recently opened its new plant at Clifton, N. J. . . . General Electric Co. has opened a new analytical chemistry laboratory to broaden its studies of material substances.

News of the AUTOMOTIVE

HIGH-FLYING PLATFORM

Shown at the recent British Industries Fair is the new Simon Hydraulic platform. Maximum platform height is 36 ft above the ground, and working radius is 23 ft. Turntable on the flat-bed truck can rotate continuously in either direction. It is self-powered by a small gasoline engine which drives the hydraulic pump. There are duplicate controls on the platform and turntable.

Rathborne, Hair & Ridgway Marks Century of Service

Rathborne, Hair & Ridgway Box Co., which has traced its growth from a small planing mill and box factory at Wells and Polk Sts. in Chicago, to one of America's leading manufacturers of shipping containers, is celebrating its 100th anniversary this year.

In observance of its centennial, the company recently published its "100 Year Story," a colorful volume describing the firm's steady rise to its present position in the container industry.

The early history of the company reveals a series of involved partnerships, mergers, and family alliances. The company attained its final form under the name Rathborne, Hair and Ridgway only in 1893.

After the turn of the century, the management of the company inaugurated a far-reaching expansion program. Realizing the potential of the shipping container industry, it established numerous saw mills and wooden box plants throughout the great timberlands of Wisconsin and Minnesota. Later, after wirebound machines were installed in the Chicago plant and the demand for wirebound boxes increased, the company erected mills and plants in Louisiana, Mississippi, Florida, and Georgia.

Wirebound plant and veneer mill of Rathbone, Hair & Ridgway Box Co. at Savannah, Ga.

To aid the firm's expansion in the corrugated box field, Rathborne, Hair and Ridgway purchased the Dearborn Paper Products Co. in 1933. This division has expanded with the increased demand for corrugated containers and is today an important part of the company's operations.

Rathborne, Hair and Ridgway's position in the wirebound and wooden box industry was later further enhanced through the acquisition of the National Box Co. and the Republic Box Co.

NINE MONTHS SALES ABOVE ALL BUT TWO WHOLE YEARS

1955 U. S. Motor Vehicle Factory Sales*

	Passenger Cars	Trucks	Buses	Totals 1955	Totals 1954
January	635,513	89,676	190	725,379	561,134
February	677,705	67,081	176	744,942	534,145
March	791,290	102,992	325	894,597	633,054
April	753,434	127,887	519	881,840	631,709
May	721,139	127,941	313	849,393	568,611
June	647,956	119,215	309	767,102	996,870
July	658,736	109,589	296	768,621	530,415
August	620,610	96,119	434	716,163	521,490
September	467,946	91,894	223	559,962	369,942
Total—Nine Months	5,973,920	931,374	2,785	6,906,079	4,999,396

1955 U. S. Motor Truck Factory Sales by G.V.W.*

	8,000 lb. and less	8,001-10,000	10,001-14,000	14,001-16,000	16,001-19,500	19,501-26,000	Over 26,000	Total
January	42,396	15,056	4,098	19,469	4,743	3,007	3,927	89,676
February	30,038	11,277	2,645	11,911	3,875	3,096	4,222	67,061
March	46,016	18,275	4,156	19,176	4,394	3,241	4,985	102,992
April	61,366	22,178	4,634	23,779	5,416	4,231	6,084	127,887
May	60,207	21,721	5,149	24,426	5,408	3,734	6,222	127,941
June	52,726	20,753	4,109	22,677	7,709	4,382	6,658	119,215
July	48,363	18,613	3,711	22,164	6,753	4,221	5,564	109,589
August	41,462	16,015	3,268	19,467	5,956	3,470	5,519	96,119
September	46,626	19,646	3,125	14,496	4,311	2,720	4,767	91,894
Total—9 Mos. 1955	432,293	199,732	34,991	174,773	49,465	32,116	48,004	931,374
Total—9 Mos. 1954	383,081	142,616	29,662	149,982	34,982	36,349	30,670	706,864

* Automobile Manufacturers Association.

Ford Claims 20% Of Buyers Are Requesting Seat Belts

First report on sale of safety belts comes from Ford Div. At a press preview of the 1956 Thunderbird, L. W. Smead, general sales manager of the Ford Div., revealed that about 20 per cent of the buyers are requesting seat belts. In addition, he said, about 70 per cent are ordering crash panels and padded sun visors. All items are being offered by Ford as optional equipment. Chrysler Corporation reports that its dealers sold 6000 safety belts between Sept. 1 and mid-October.

AND AVIATION INDUSTRIES

Stockholders Approve Sale Of Universal To Chrysler

Universal Products Co., Inc., now officially is part of the Chrysler Corporation. Stockholders early this month approved sale of the company's plants, equipment and inventories to Chrysler for between $3 million and $3.5 million.

Goodyear Gives Details Of New Synthetic Rubber

Tremendous strides are being made by rubber manufacturers in developing a new type of synthetic rubber for tires which eventually may replace natural rubber. Goodyear Tire & Rubber Co. reports "success" in making a synthetic rubber with molecular structure similar to natural rubber. It is the third rubber company to announce such a development.

Although it is expected to take several years yet before the new type of rubber is put into volume production, the new rubber shows great promise. Goodyear has not yet named its latest test tube rubber, but says its identity has been confirmed by the striking resemblance of its X-ray and infra-red diagrams to those of the tree-grown variety. These methods of "finger-printing" chemical compounds are often considered better evidence of the existence of large molecules like those of natural rubber, than physical evaluations.

In giving further details of its new process, Goodyear said it used a catalyst similar to one discovered in Europe for making polyethylene plastics. Although the catalysts used in the new process do not themselves become part of the final rubber, they help build up the huge rubber molecules from a basic building block known as isoprene, Goodyear explained.

Buick Converting Jet Plants Into Automotive Production

Two plants formerly used by Buick for manufacture of jet engines are being converted to automotive production following completion of contracts with the Air Force. They include one at Willow Springs, Ill., which will be taken over by Fisher Body Div., and another in Flint, to be used for production of Dynaflow transmissions. Buick turned out more than 4000 Wright J-65 engines at both plants under contracts with the Air Force.

Austin-Healey 100 Sports Car Has Four-Speed Transmission

The new models of the Austin-Healey 100 sports car, now being delivered in the U. S., feature a new four-speed transmission, plus overdrive on third and fourth, thus giving a driving choice of six forward gear ratios. The overdrive is controlled, as in previous three-speed gearbox models, by a control switch on the dashboard.

Other modifications on the Healey include larger brakes, new cam gear steering, "C" Series type hypoid rear axle, and tapered roller bearings on the front axle. Standard rear axle ratio has been changed from 4.125 to 4.1.

Record Vehicle Output Seen For Great Britain

Vehicle production in Great Britain should reach a record 1.25 million this year, according to Harlow H. Curtice, president of General Motors. This is an impressive figure, and it would represent about an 18 per cent increase over production in that country last year.

During his tour of the corporation's European operations to review progress on the $200 million expansion announced last year, Curtice also made some predictions about how GM production would fare in the overall European picture. Although the GM Vauxhall Motors, Ltd., plant at present is limited to existing capacity, Curtice estimates it will nonetheless produce a record number of 143,200 cars and trucks this year. Nearly 55 per cent of Vauxhall's production is being sold in export markets.

Continued on Page 104

OCT. '55 OUTPUT MORE THAN DOUBLES OCT. '54

1955 Passenger Car Production

As reported direct to Automotive Industries by the car factories

	October 1955	September 1955	October 1954	Ten Months 1955	Ten Months 1954
Hudson	1,305	1,747	3,470	42,562	28,019
Nash	866	3,406	5,780	89,606	55,395
Total—American Motors	2,171	5,153	9,250	132,168	83,414
Chrysler	14,896	5,897	4,986	144,670	71,775
De Soto	11,334	5,568	2,836	106,032	46,619
Dodge	28,253	20,398	6,265	257,203	94,134
Plymouth	60,067	4,224	14,858	599,860	277,299
Total—Chrysler Motors	114,574	35,886	31,087	1,107,765	492,827
Ford	162,597	106,083	30,420	1,447,971	1,139,539
Lincoln	3,846	3,786	1,227	31,244	30,930
Mercury	42,096	24,096	9,906	361,824	221,009
Total—Ford Motors	208,439	134,767	41,553	1,841,039	1,392,478
Buick	18,976	67,592	14,637	649,530	420,090
Cadillac	9,991	3,752	3,370	123,700	97,484
Chevrolet	85,170	120,534	72,440	1,498,674	1,126,177
Oldsmobile	24,757	53,452	20,965	527,702	354,101
Pontiac	47,451	24,646	31,790	494,630	255,735
Total—General Motors	186,345	279,979	143,196	3,270,336	2,294,187
Packard	4,426	198	None	67,934	28,281
Studebaker	550	5,362	11,212	69,956	68,011
Total—S-P Corp.	4,976	5,560	11,212	147,890	91,292
Kaiser	None	None	None	1,002	5,099
Willys	None	None	243	5,077	9,600
Total—Willys Motors	None	None	243	6,079	14,699
Total—All Makes	517,505	461,337	236,526	6,510,699	4,350,967

NEW DEPARTURES OF TOMORROW

TOMORROW: A ribbon of paving unreels as this road-builder of the future turns open country into superhighway.

TODAY: New Departure ball bearings are used in power shovels, trucks and similar heavy-duty equipment, because they require no special attention and virtually no maintenance. Frequently they outlast the machine itself.

What a simple matter road building would be if it were reduced to a single machine that levels, grades and paves . . . all in continuous operations. Such future prospects are often made practical through New Departure ball bearings. With New Departures, moving parts are held in close alignment while handling loads from any angle. Delays for adjustment and maintenance are eliminated. That's because these ball bearings are designed for high capacity and manufactured to close precision tolerances . . . by the company that has originated many of the greatest advances in ball bearings. So if you are designing or improving a product for efficiency and endurance, call New Departure for *your* ball bearings.

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT

NEW DEPARTURE
BALL BEARINGS
NOTHING ROLLS LIKE A BALL

Men in the News

Match & Merryweather Machinery Co.—D. M. Hallier is now manager of cutting tools.

Bendix Products Div., Bendix Aviation Corp.—**Frank E. Farrell** has been appointed director of sales for automotive products, and **Forrest L. Dunbar** has been named director of industrial relations.

Brush Electronics Co.—**John H. Harris** has been made vice-president in charge of planning, and **Wallace T. Gray** has been chosen general works manager.

American Chemical Paint Co., Metalworking Chemicals Div.—**F. P. Spruance, Jr.**, is now sales director, succeeding **F. P. Spruance, Sr.**, resigned.

Houdaille-Hershey Corp., Automotive Div.—**Sidney E. Leese** has been named chief engineer.

Clark Equipment Co., Transmission Div.—**Donald E. Stoops** has been named manager of distributor sales.

Goodyear Aircraft Corp.—**Frederic W. Mellor, Jr.**, has been named manager of laminated products sales.

General Electric Co.—**George E. Tubb** has been appointed manager of marketing for the Small Aircraft Engine Dept.

Nash Motors Div., American Motors Corp.—**L. E. Stewart** has been promoted to assistant to the sales vice-president; **G. B. Stone, Jr.**, special assignment representative; and **L. M. Puraley**, national business management manager.

New York Air Brake Co. — Frederick L. Guyette has been made chief plant and equipment engineer.

Michigan Tool Co.—J. J. Plumb has been promoted to purchasing agent of the Machine and Tool Div., and Milton C. Ton has been made purchasing agent of the Cone-Drive Div.

Thermoid Co.—**J. Robert Keach** was elected a vice-president.

Mercury Div., Ford Motor Co.—**George S. Coats** is now assistant general sales manager in charge of all field operations.

Timken Roller Bearing Co., Automotive Div.—Robert G. Wingerter has been appointed general manager.

Ethyl Corp.—**George F. Kirby** has been elected vice-president in charge of research and engineering.

Pontiac Varnish Co.—**Harold A. Muehlbeck** is now industrial sales manager.

General Electric Co.—**Bertram W. Mahoney** is now general manager of the Industry Control Dept.

Borg-Warner International Corp.—**Alonzo B. Night** has been elected vice-president.

Chrysler Corp., Defense Operations Div.—Irving J. Minett has been appointed manager, and John D. Moran has been named director of manufacturing staff activities.

Waukesha Motor Co.—Charles E. Nelson has been elected secretary and treasurer.

Joseph T. Ryerson & Son, Inc.—**Napier B. Caldwell** was made sales manager for the Boston plant, and **Joseph A. Moran** succeeds him as manager of tubular products and cold finished steel bar sales.

Stillman Rubber Co.—**Philip B. Keller** has been made vice-president in charge of engineering.

Detroit Bevel Gear Co.—**William Taylor** is now assistant to the president.

Garlock Packing Co.—**George L. Abbott** was elected chairman of the board and chief executive officer, and **Robert M. Waples** succeeds him as president.

Necrology

Sir Arthur Du Cros, 84, founder of the Dunlop Rubber Co., died Oct. 29, at Oxhey, England.

Melbourne Carpentier, 59, assistant chief engineer of the Chassis Design Section of Chrysler Corp., died Oct. 18, at Highland Park, Mich.

Frederick P. Bernhard, 77, retired controller of International Nickel Co. of Canada, Ltd., died Oct. 30, at Summit, N. J.

Glen W. Walker, 60, vice-chairman of the board of Corning Glass Works, died Oct. 18, at Corning, N. Y.

Joel Thorne, 40, former owner and driver of Indianapolis race cars, was killed recently in an airplane crash, at North Hollywood, Calif.

Harold N. Arbuthnot, Washington representative for Allegheny Ludlum Steel Corp., died recently, at Washington, D. C.

WALLACE BARNES COMPANY
BRISTOL, CONNECTICUT
the WILLIAM D. GIBSON COMPANY
RAYMOND Manufacturing COMPANY
CORRY, PENNSYLVANIA
BARNES-GIBSON-RAYMOND
PLYMOUTH, MICH.
B-G-R COOK PLANT
ANN ARBOR MICHIGAN
DIVISIONS OF ASSOCIATED SPRING CORPORATION
COAST TO COAST
SEABOARD Coil Spring Div.
OHIO DIVISION
DAYTON, OHIO
WALLACE BARNES COMPANY
SYRACUSE, N.Y.
MILWAUKEE DIVISION
DUNBAR BROTHERS COMPANY
BRISTOL, CONN.
E. H. HANLOSS AND SONS CO.
BRISTOL CONNECTICUT
THE WALLACE BARNES CO., LTD.
HAMILTON CANADA
"It's the best brand in the land..."
LET US TUNE UP
YOUR SPRINGS
SMALL
STAMPINGS
SPRING WASHERS
WIRE FORMS

3 Better Methods with ROLLPIN

TO REPLACE A RIVET Rollpin's spring action firmly fastened radio transformer laminations in place and did two things a rivet couldn't do—aligned the laminations and compensated for minor hole variations.

TO REPLACE A STOP PIN Rollpin's self-locking action eliminated staking or peening operations required to retain a straight solid pin.

TO REPLACE A SET SCREW on automobile brake handle, Rollpin is self-retained in the hand grip but can easily be driven into overdrilled hole in shaft to free handle, then removed and used again.

Where can you use this simple fastener?

If you use locating dowels, hinge pins, rivets, set screws —or straight, knurled, tapered or cotter type pins, Rollpin offers the opportunity of a better method that can cut assembly and maintenance costs. This slotted tubular steel pin with chamfered ends eliminates special machining, tapping, and the need for precision tolerances. Driven into a hole drilled to normal production standards, it locks securely in place, yet can readily be drifted out and reused whenever necessary.

TO REPLACE A DRIVING PIN for a flexible drive shaft on a washing machine, Rollpin cut assembly costs by eliminating precision drilling and reaming

MAIL COUPON FOR DESIGN INFORMATION

Elastic Stop Nut Corporation of America
Dept. R37-115, 2330 Vauxhall Road, Union, N. J.

Please send the following free fastener information:

- ☐ Rollpin samples
- ☐ Rollpin bulletin
- ☐ Here is a drawing of our product. What self-locking fastener would you suggest?

Name _____ Title _____

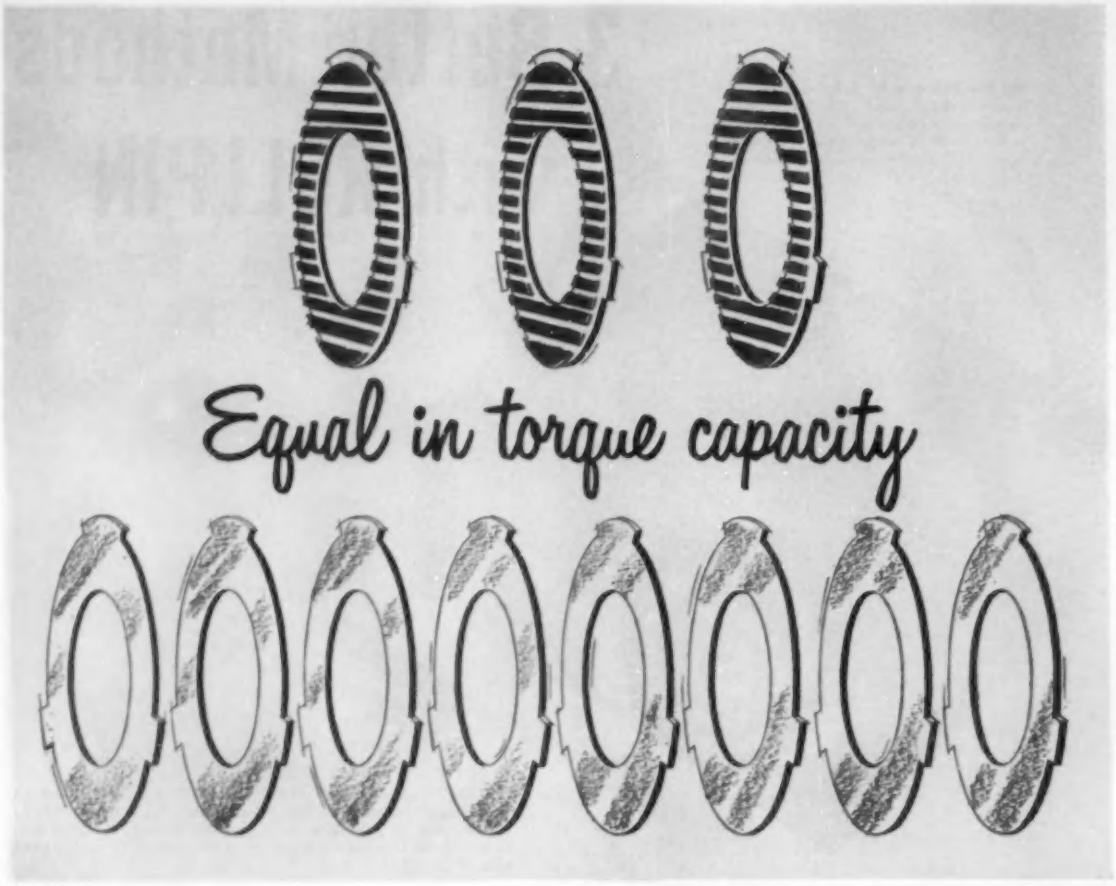
Firm _____

Street _____

City _____ Zone ___ State _____

ELASTIC STOP NUT CORPORATION OF AMERICA

ROLLPIN TRADEMARK



How to make 3 clutch plates do the work of 8

A leading appliance manufacturer modified the transmission in his automatic washing machine to make use of cork-faced clutch plates.

The result? A lighter, simpler, less costly transmission—with the required torque now being delivered by three cork facings in place of eight other plates called for by the original design.

Cork makes design economies like this possible because of its inherently high torque capacity. Cork, in fact, retains a higher coefficient of friction when immersed in the oil of a wet clutch than any other friction material. Because of this, cork will transmit a given amount of torque with fewer or smaller plates —or lower engagement pressures. This permits the use of smaller, less complex hydraulic systems.

Cork helps reduce costs in other ways, too. First of all, it costs less than most friction materials. And there's no need for surface or finish grinding when you use cork facings. They're resilient and mate perfectly with their opposing plates.

Most important, cork is a *dependable* facing material. A cork facing in a properly designed wet clutch will last the life of an appliance or automobile. There's virtually no wear in normal service—and no abrasive particles to contaminate oil and damage gears.

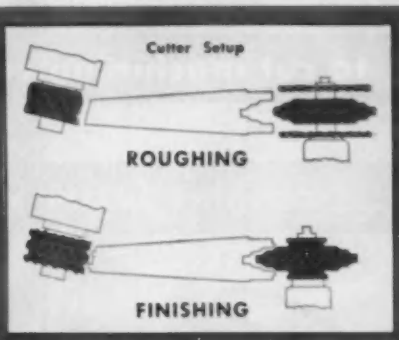
For the whole story on cork friction materials, send for a copy of "Armstrong Resilient Friction Materials." Write Armstrong Cork Company, Industrial Division, 7211 Imperial Ave., Lancaster, Pa.

Armstrong FRICTION MATERIALS

. . . used wherever performance counts

CUSTOMER SPECIFIED

KEARNEY & TRECKER MILWAUKEE DESIGNED



A leading electrical equipment manufacturer needed a production machine to rough-and-finish mill a variety of sizes of chrome-nickel-steel steam turbine blades — 4" to 30" long. Specifications called for a machine that would cut milling costs and maintain accuracies within thousandths of an inch. Solution: They called on Kearney & Trecker to develop and build the machine.

Production rates are dependent upon workpiece size. For example, twenty-seven 13½" chrome-nickel-steel blades are rough-and-finish milled per hour by this new Kearney & Trecker Two-Spindle Bed Type machine.

Rectangular index table with two work-holding fixtures enables the operator to unload and load one fixture while the other is in work. This sequence eliminates down-time and keeps production constant.

Dovetail end of blade is rough-and-finish milled with the lower spindle, using a combination of special form and side mills. Head, mounted in an inverted position on a saddle, is counterweighted. Tenon end of blade is milled with the upper vertical head which moves in an arc on radial ways . . . angular adjustment of 45° is possible.

Other machine features include air-clamping for machine table . . . automatic chip conveyor . . . high volume coolant pump . . . easy to change pick-off gears for each head to select exact desired spindle speeds.

New production efficiency starts with Kearney & Trecker Milwaukee machine tools

Kearney & Trecker automatic production machines perform many operations to exacting accuracies and at lower cost. But most important to you — it's accomplished by combining standard design components with a minimum of special engineering. This means you get the production you want, the economies you need, from job-proven designs with minimum of capital investment.

With more than 50 years' experience in machine design and manufacture, Kearney & Trecker has the all-around ability to meet your production needs. Take advantage of these abilities. They can pay off in lower machining costs and more profits for you. See your Kearney & Trecker Special Machinery Division representative. He'll be glad to help you with your production requirements. Call him today.

For more details on machine illustrated ask for Data Sheet No. 1067. Booklet "Doorway to a proven method for solution of big and small metalworking problems" is also yours for the asking.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Special Machinery Division

MILWAUKEE 14, WISCONSIN, U.S.A.

Builders of Precision and Production Machine Tools Since 1898

to cut machining costs

machine faster with

Continuous Broaching

■ Higher machining production than ever achieved by any other method has been made possible in many cases through the use of the Footburt Continuous Surface Broaching Machines. In most cases, production is limited only by the speed at which parts can be loaded into the self-clamping fixture. Unloading is automatic. If you have a problem of high production on small parts, send blueprints and hourly requirements.

THE FOOTE-BURT COMPANY
Cleveland 8, Ohio
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☆engineered for production

FOOTBURT

PIONEERS IN SURFACE BROACHING

Breaking the Sound Barrier

TEMCO helps build the supersonic **F-100** Super Sabre

Recently, North American awarded TEMCO three important jobs on the Air Force F-100 Super Sabre.

This fighter was the first operational aircraft to break the sound barrier in level flight. Vital F-100 components — wing-tip panels, ailerons, flaps, pylons — are being fabricated at TEMCO.

These jobs are typical of TEMCO's work on a growing number of first-line military aircraft. And, on its 10th Anniversary, TEMCO pledges a continuing effort to preserve the peace by keeping America strong — **the industry's Number One Job.**

ENGINEERS . . . if you are interested in a position with a growing weapons system organization, write full particulars to E. J. Horton, Jr., Engineering Personnel, TEMCO Aircraft Corporation, P. O. Box 6191, Dallas 2, Texas.

TEMCO
AIRCRAFT CORPORATION
DALLAS, TEXAS

Douglas DC-8 jet transport

Aircraft Production Forum

Highlight of SAE Aeronautic Meeting

By R. Raymond Kay

How to bring engineering and manufacturing closer together—to pay off in better production planning and in problem solving. That was the job cut out for SAE's Aeronautic Meeting this year in Los Angeles.

Aircraft Production Forums are becoming more and more popular. There is always something stimulating for every participant. Standing room only is the rule of the day. The commodious new Statler Hotel is becoming too small to hold the large audiences.

Again this year the two-day Aircraft Production Forum was the highlight of the four-day mid-October meeting. Engineers from all over the U. S. shared in the pool of production information.

Some 100 top-flight aircraft industry men presented the latest ideas on: control of manufacturing costs; quality control; tool control; machining, tracer and profile; forming of titanium and high strength steels; process control; forging techniques to reduce machining; flight line operations; plastic tooling; wings; landing gears; powerplant installations and components; fuselages; plant layout; preventive maintenance and equipment replacements.

These subjects—all helpful to the faster and more economical production of better planes and engines—generated plenty of lively floor discussion.

Here's the trend of thinking gleaned from each panel:

Forging Techniques to Reduce Machining

Considerations affecting the use of press forgings in airframe construction: Most inefficient part of any design exists at fastener type joints due to duplication of material. A process, such as forging, which combines structural components into a single part, considerably increases structural efficiency. . . . A. C. Carlson, senior supervisor, KC-135 Project, Boeing Airplane Co.

Progress in conventional forging to reduce machining: With improved equipment and a bolder development technique we are now beginning to see a much

brighter future in the reduction of machining costs through the further development of conventional forgings. . . . G. W. Motherwell, vice president engineering-development, Wyman-Gordon Co.

Manufacturing problems related to forgings: In the case of plate stock and extrusion, the finished part weight is approximately 10 per cent of the raw material weight. In the case of conventional forgings, the finished part weight is approximately 50 per cent of the finished forging weight and, in the case of a root rib precision forging, the finished part weight is about two-thirds of the raw weight. . . . J. C. Mueller, chief industrial planner, North American Aviation, Inc.

Adapting precision forging techniques to large presses: The fact that the precision process admits of no "margin for errors" has been previously mentioned and this fact can never be lost sight of or neglected in any of the manufacturing operations. . . . A. E. Favre, chief die design engineer, Aluminum Co. of America.

Production design considerations — precision forgings vs machined conventional forgings: Precision forgings are just beginning to really find their place in the airframe production picture. It may be expected that they will ultimately represent 30 to 50 per cent of production requirements for all forgings in terms of quantity. . . . C. F. Marschner, department manager, production design, Georgia Div. of Lockheed Aircraft Corp.

Wings

It is apparent that the thin, highly loaded wings of today's aircraft require the use of new construction. Advent of new designs brings associated problems. A few examples: Integral fuel tanks, integrally machined skins, integrally stiffened extruded skins, warpage of large machined forgings, and the use of new materials like titanium. Engineering and Manufacturing are working together to solve these problems, taking into account design requirements, manufacturing methods, the development of new techniques and processes, tooling and production breakdowns.

Control of Manufacturing Costs

Most significant fact: Effective control of indirect costs has become increasingly necessary in aircraft manufacturing. Considerable thought, planning, and action goes into this.

General trend in the field: Increased use of standards for measuring costs, especially those identified as indirect.

Most interesting problem—how solved: "Feed back" of cost information to the design engineer during the instigation of the program. In this way the most economical "end product" cost is designed into the product. Representatives from different aircraft companies described various methods of "feed back" and control, reporting that cooperative liaison and reporting methods solved the problem for them.

New developments: Establishing standards for indirect functions is gaining widespread popularity.

Fuselage

Most significant fact: Closer cooperation between Engineering, Tooling, and Manufacturing to share in the responsibility of manufacturing cost.

General trend in the field: Accumulation of data for cooperative analysis of production problems in the predesign period. And then team approval of the decisions concerning those problems.

Most interesting problem—how solved: How can cooperation be maintained? By each department having an open ear to the problems of the other. By a concentrated effort to understand the basic policies of the other department.

New developments: Basic interiors should be laid out on the basis of loft data — and development of tolerance data on structures that should become a part of engineering design criteria. This should improve the relationship of outside contour to internal structure.

Machining, Tracer and Profile

Most significant fact: Digital methods—the presentation of dimensional information to machines in numerical form, has been demonstrated . . . permits accuracy in terms of the drawing dimensions rather than in terms of toolmaking tolerances.

General trend in the field: Digital methods as a means of contour machining control will become quite common in the next few years.

Most interesting problem—how solved: How can the high cost of digital control equipment be economically justified? Divorce the director from the machine by recording the director's output on magnetic tape. Thus the director can prepare tapes for many machines. The control for using the magnetic tape is quite simple and not so costly.

New developments: Most significant is the digital control of machine tools via coded information on tape or cards. This will: (1) reduce operator errors; (2) increase production; (3) improve tolerances; (4) reduce elapsed tooling spans.

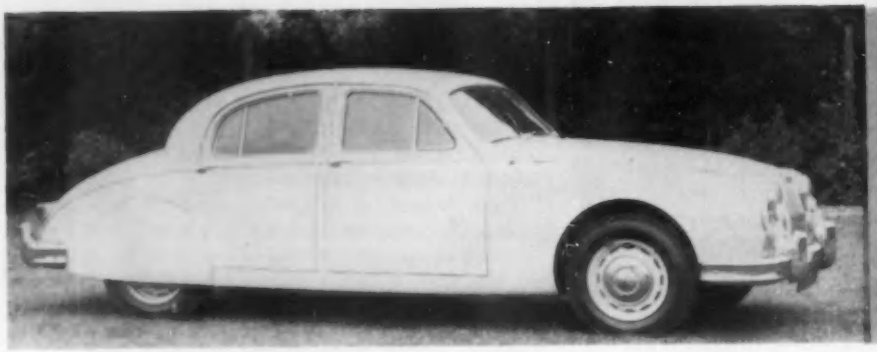
Powerplants

Most significant fact: Fuel leaks and line fittings problems are common. Aerodynamic requirements are making inlet duct of nacelle design more rigorous. Compressor stall won't be solved easily.

General trend in the field: To more complicated structural assemblies and more difficult aerodynamic requirements (inlet ducts, etc.). They require more closely controlled tolerances and more careful design.

Most interesting problem—how solved: Engine damage from foreign objects entering inlet ducts and engines. Solved by use of run-up and taxi screens, more careful inspection, and better housekeeping of runways and run-up areas. Results were a definite reduction of damage incidence.

(*Turn to page* 122, *please*)



Small 2.4-liter Jaguar with integral body - frame construction.

By David Scott

Higher Output Engines

LONDON, ENGLAND

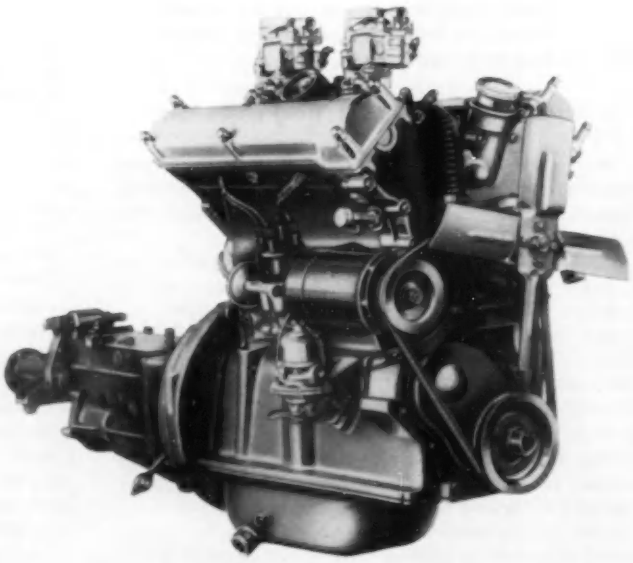
THE International Motor Show in London last month was the occasion for some serious stocktaking about the way ahead for the British automobile industry. Severely restricted overseas markets are heralded by Australia's import cuts. Foreign competition, particularly from Germany, has become acute. Alongside these hazards abroad is a stiff battle at home with production cost increases and consequent price rises. And while several new cars and engines were exhibited at Earls Court, there is criticism from some quarters that British designs remain traditional and conservative in contrast with inspired models made by French, German and Italian rivals.

Despite all this, production has climbed to an all-time high with a current annual rate (based on the first nine months of this year) of 880,000 cars. Exports have kept pace, and still constitute about 45 per cent of output. Thus the U.K. continues as the world's largest vehicle-exporter, although its share of the total has dropped.

Germany is close on its heels in both production and exports, and is rapidly gaining ground. German figures for September show that output was 22 per cent and exports 32 per cent over August. Volkswagen is spearheading the race for markets, and the concern among British manufacturers caused by this competitor is difficult to overstate.

Australia's import restrictions have dealt a body blow to the industry, since that country has been taking some 25 per cent of Britain's car exports. New Zealand, its second largest market, has followed suit. The first reaction was Rover's cutting down to a four-day week, for these two countries take 75 per cent of the jeep-like Land Rover output.

Other firms have not been affected so seriously, but the long-term outlook is clouded by recent gloomy pre-



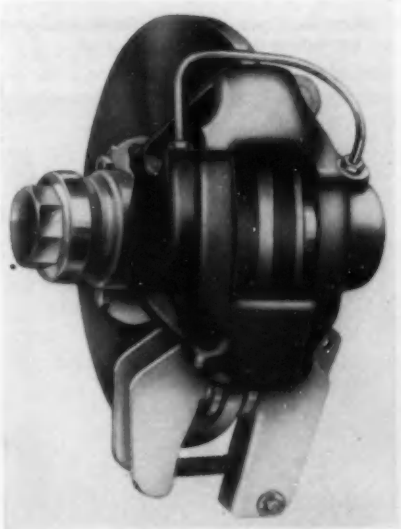
Engine of 91.3 cu in. for the Singer Hunter now features two overhead camshafts, twin carburetors, and a four-branch exhaust manifold. Power has been raised to 75 hp at 5250 rpm.

Latest Standard Vanguard is lower in weight with higher engine output give improved performance and economy

Among Features of London Show

dictions made by the Australian Federal Treasurer. Difficulties now confronting exporters of primary produce, he said, threatened to grow worse rather than better. A drop in their purchasing power caused by falling commodity prices would result in a loss of markets to industrial countries.

Anticipating this trend, as well as the desire of their best overseas customers to foster their own vehicle industries, all the big British makers have established assembly and manufacturing plants in Australia and other Dominions. They are striving to increase the local content of cars built there so as to escape future squeezes.



Girling rear disk-brakes with hand brake attachment

At the same time, the motor industry is headed for trouble on the home market due to measures taken by the Government to curb consumption in order to stimulate exports and combat balance of payments difficulties. Demand for new cars continues well ahead of supply, and waiting time is up to 18 months for popular models. To discourage buyers and ward off inflation, increased down payments and higher interest rates are already required. For many years the sales tax on cars has added 50 per cent to the wholesale price. But during the show the Government raised this to 60 per cent to curtail domestic sales further, and thus provide additional negative incentive to export.

All this is happening while the British motor industry is pushing ahead with its major expansion program. Total new investment planned is around $500 million, including $182 million by Ford and $100 million by G.M.'s Vauxhall. Wider outlets both at home and abroad to absorb the greater production are essential if these outlays are to be justified, and the immense tooling costs spread thinly over a big volume of cars. A large and stable home market is necessary if British prices are to be competitive, yet at the moment the signs point in the other direction.

Even at best the potential absorption of cars by the British market is limited. Neither the industry nor the buying public is geared to the annual model change. The average owner holds onto a new car for perhaps five years before trading it in. Aside from the lower purchasing power, possession of the latest model does not carry the same social prestige as in America. Beyond this, roads in the metropolitan areas of these small islands are totally inadequate to handle even the present number of vehicles.

Production costs are a basic consideration, and already the pressure is on. On the eve of the motor show a number of manufacturers announced price increases. Among these were Vauxhall, Rootes, Standard and Rover. Ford, B.M.C. and a few others

have temporarily kept the lid on, although several makers have indulged in disguised price hikes by offering de luxe versions of their cars for more money. Rising material and labor costs are claimed to counterbalance the greater turnover and trading profits recorded by many firms this year.

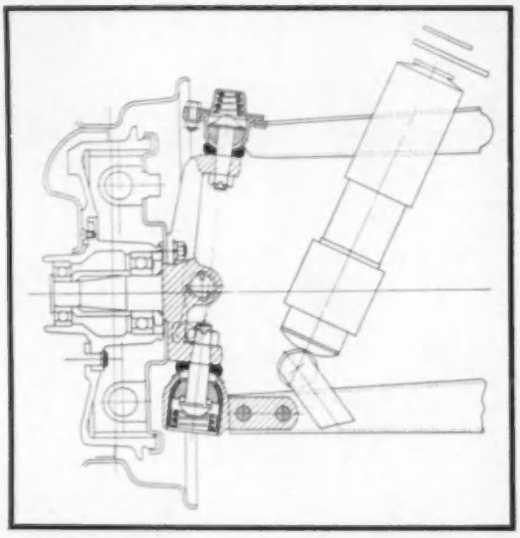
The cost question is linked to the issue of radical design changes to meet competition from more adventurous European makers. Critics of British orthodoxy point to the novel engines, cooling systems, transmissions and suspensions of such cars as the VW, Renault, Panhard and Fiat 600. The unconventional has gained wide acceptance in markets like Belgium, Switzerland and Sweden where British cars once reigned supreme. Now the appearance of the revolutionary Citroen DS 19 has given new impetus to these strictures.

Just before the show opened the Technical Director of Standard gave one answer. E. G. Grinham pointed out that outside suppliers of such components as brakes, clutches, springs and body hardware have standardized their equipment, "and if we depart from their standards there is a considerable price increase." He added that the whole industry is becoming standardized, "and it is difficult to break away from this position without increasing the cost of our products, which in turn will affect our sales."

On the same occasion Standard's Chairman, Marshal of the Royal Air Force Lord Tedder (General Eisenhower's war-time deputy), emphasized that

(*Turn to page* 150, *please*)

Sunbeam Rapier has the pivoting rear window of the Hillman Californian

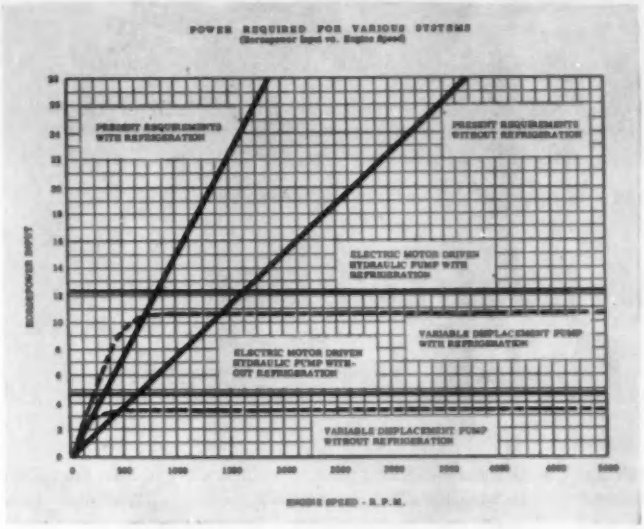


Layout of the Thompson front suspension joint presented by Automotive Products

Daimler One-O-Four is available in several body variations. Engine power is increased to 137 hp, and transmission includes fluid drive with preselector gearbox.

New Automotive Equipment

ANALYZED AT HYDRAULICS CONFERENCE


POWER REQUIRED FOR VARIOUS SYSTEMS
PRESENT REQUIREMENTS WITH REFRIGERATION
PRESENT REQUIREMENTS WITHOUT REFRIGERATION
ELECTRIC MOTOR DRIVEN HYDRAULIC PUMP WITH REFRIGERATION
VARIABLE DISPLACEMENT PUMP WITH REFRIGERATION
ELECTRIC MOTOR DRIVEN HYDRAULIC PUMP WITHOUT REFRIGERATION
VARIABLE DISPLACEMENT PUMP WITHOUT REFRIGERATION
ENGINE SPEED - R.P.M.

By Paul Kennedy

AUTOMOTIVE hydraulic equipment received considerable attention at the Eleventh Annual National Conference on Industrial Hydraulics. The conference, attended by some 800 engineers, is sponsored by the Illinois Institute of Technology at Chicago with the cooperation of the hydraulics industries and engineering societies.

Control System

Details of proposed central hydraulic systems for passenger cars were reviewed by John A. Lauck, vice-president and director of engineering of Pesco Products Div., Borg-Warner Corp. He described in general terms the requirements for a variable volume pump system to operate such accessories as fan, generator, air conditioning, windshield wiper, windows, steering, brakes, and seat. Fail-safe design of the steering and brake systems would be necessary, he said, and he disclosed that a method has been devised to use the present open center valve power steering designs. Operating at 1000 psi, the system would require either a pressure reducing valve or debooster cylinder for present window and seat equipment. The generator drive would consist of a constant speed hydraulic motor, which would permit installation wherever convenient and also eliminate the voltage regulator, according to Lauck. The fan drive could consist of a hydraulic motor, or a hydraulically actuated clutch which was the speaker's choice as most efficient.

Maximum operating temperature of the hydraulic fluid would be 200 F plus or minus 20 degrees. A slight amount of cooling would be required to cool about one gallon per minute down to 75 deg above ambient. Commenting on this system, V. A. Speece of White Motor Co., thought that for heavy duty trucks it would be most useful where large loads require intermittent linear translation. A new inexpensive accumulator is needed in order to lower the required pump capacity, Speece stated, and added that any system should be interchangeable with present truck and trailer air systems. He indicated also that fan drive benefits are not yet equal to the cost.

Tractor Power

The Hydra-Touch system was described by Gordon L. Herschman, chief engineer of International Harvester Co. The system provides power to mounted and trailing farm implements and is semi-automatic in operation. It consists of a spool type valve which is returned to neutral (by-pass) through a hydraulically operated detent when the power cylinder completes the desired stroke.

The valve can operate both single acting and double acting cylinders, has a lock and float position for single acting cylinders, and locks both hydraulic lines of double acting cylinders. One companion valve containing a regulator valve and safety valve is required for each system. Normally three valves are banked together with one regulator-safety valve unit.

The system operates at approximately 35 psi by-pass pressure and 1500 psi maximum safety valve pressure. The valves will latch in detent at working pressures up to 900 psi and will release the hand lever to return to neutral at 1200 psi maximum pressure. The detenting

(*Turn to page* 178, *please*)

The Golden Hawk, top model in Studebaker's special line of sports-type models. It has a 275-hp 352-cu in. V8 engine, developing 380 lb ft of torque at 2800 rpm. The five-passenger model is 17 feet long, six feet wide and less than five feet high

Studebaker Adds Full Line of Sports Models for '56

NEW styling, new engines ranging up to 275 hp, a series of high-performance five-passenger sports-type cars, engineering advances and safety innovations are features in the Studebaker passenger cars for 1956.

Studebaker's new lines include 16 models—12 in the sedan and station wagon series, and four in the sports-type group.

The President Classic four-door V-8 is powered by a new Sweepstakes 289-V8 engine with four-barrel carburetion. Also powered by the Sweepstakes 289-V8 are two other sedans in the President series and the Pinehurst President station wagon.

Commander sedans and the Parkview Commander station wagon feature the new Sweepstakes 170 hp 259-V8. Power kits, comprised of four-barrel carburetion and dual exhaust, will be available as optional equipment and will increase the 259-V8 horsepower to 185.

Champion sedans and the Pelham Champion station wagon have an improved Sweepstakes 185 six engine, with 101 hp.

The President engine, with 289 cu in. displacement, develops 292 lb ft of torque at 2800 rpm. The Commander engine, with 259 cu in. displacement, develops 260 lb ft of torque at 2800 rpm.

Mechanical innovations include an advanced automatic transmission—the new Flightomatic; special finned brake drums said to increase cooling by 100 per cent to maintain non-fade efficiency when heavily used, and a color-lighted "safety-eye" speedometer.

With the new array of sports-type cars, Studebaker becomes the first of the industry's full-line manufacturers to offer a complete series of full-size five-passenger sports models. In addition to the super-powered Golden Hawk, the series includes the 210-hp Sky Hawk, the 170-hp Power Hawk, and the 101-hp Flight Hawk. The Golden Hawk, with its 275 hp, will have a 9.5 to 1 compression ratio and will develop 380 lb ft of torque at 2800 rpm.

The new station wagons will be powered as follows: the Pinehurst will have the 289-cu in. V8 engine, which with four-barrel carburetion will develop 210 hp; the Parkview will have the 170-hp V8 engine; and the Pelham will use the 101-hp six-cylinder engine.

Four-barrel carburetion will be standard on the President Classic, Golden Hawk and Sky Hawk. In the President Classic and Sky Hawk, the two additional barrels are actuated mechanically by pressing the accelerator pedal for fast starting and passing at higher speeds. The four-barrel carburetion in the Golden Hawk is automatic-velocity controlled. In normal cruising speed ranges, two-barrel carburetion is maintained for fuel economy.

Four-barrel carburetion power kits will be available for the President series raising horsepower to 210, and for the Commander series and Power Hawk raising horsepower to 185. A special 8.3-1 high compression cylinder head will be available on all eight-cylinder engines.

Pistons in the 289-cu in. engine use a new cupped-shaped head. The mass of the charge is held close to the point of ignition, giving improved turbulence and detonation control. Fuel octane requirements are said

The President Classic four-door sedan which is powered by a 210-hp V-8 engine

STUDEBAKER SWEEPSTAKES ENGINES 1956

	Hp	Torque (lb ft)	Displacement (cu in.)
Sedans			
President Classic	210	292 at 2800	289
President Series	195*	286 at 2800	289
Commander Series	170*	260 at 2800	259.2
Champion Series	101	152 at 1800	185.6
Station Wagons			
Pinehurst	195*	286 at 2800	289
Parkview	170*	260 at 2800	259.2
Pelham	101	152 at 1800	185.6
Sports-Type Hawk Line			
Golden Hawk	275	380 at 2800	352
Sky Hawk	210	292 at 2800	289
Power Hawk	170*	260 at 2800	259.2
Flight Hawk	101	152 at 1800	185.6

* Power kits available.

to be lowered and spark advance improved. New piston contour and elimination of the vertical slot give improved dimensional stability and scuff resistance.

Oil filters now standard with all Studebaker V8 engines.

Among the features in the 1956 line is the new Flightomatic transmission which is smoother shifting and provides a full selector quadrant that includes a parking lock position. In mountainous driving, when descending long, steep grades, the Flightomatic offers the advantages of direct-intermediate-low range.

In addition to an improved manual three-speed transmission, a manual transmission with overdrive is available for all models, and Ultramatic transmission on the forthcoming Golden Hawk. This model also can be obtained with manual overdrive transmission.

All models have a new 12-volt electrical system, with output of the generator raised to 30 amp at 12 volts to meet the increased demands of new automatic and electrical features drawing on the electrical system.

The electrical system incorporates a new "easy-start" feature which provides fast engine starting in all kinds of weather. Key element of this feature is an external resistor under the hood that is connected in series with the primary circuit between the battery and coil, increasing coil efficiency.

The oil pump capacity of the Sweepstakes V8 engines has been increased by 50 per cent. The new engines have mechanical type valve lifters, heavy-duty connecting rod bearings, and a special alloy camshaft. Larger alloy inlet and exhaust valves permit maximum breathing efficiency.

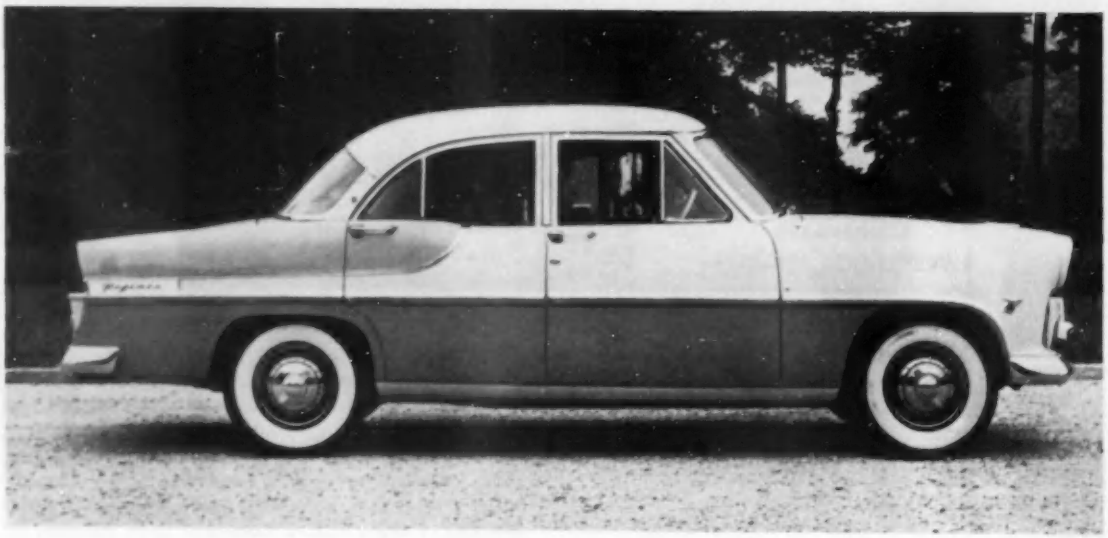
A full range of optional power equipment is available, including power steering, power brakes, power window lifts and power seats. Studebaker power steering, while doing up to 80 per cent of the work, retains sufficient road feel to assure safe operation.

Prominent among safety features are door latches on all models designed to keep doors closed under the impact of collision. Safety padding on the rear of the front seat protects passengers in the back seat who may be thrown forward if an accident occurs. Studebaker continues to offer padded instrument panels as standard equipment on some models and optional on the balance of the line. Nylon seat belts of airline type are available as an optional accessory on all models.

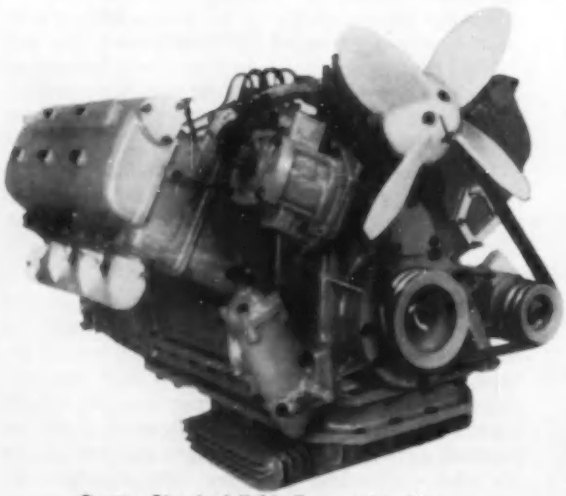
Latest Developments Displayed

at

PARIS AUTOMOBILE SHOW



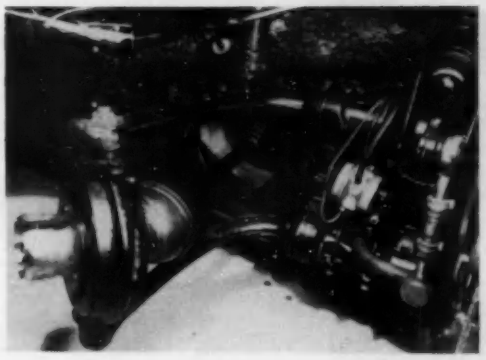
Simca Regasco, built in the ex-Ford factory



Pegaso Diesel of light-alloy construction

A LARGE variety of cars and trucks as well as automotive components were on display at the recently-held 42nd Paris automobile show, and a great deal of interest in the exhibits was shown by the huge throngs attending the exhibition.

Citroen received much attention with its new front drive DS 19 which features hydro-pneumatic suspension front and rear and the use of hydraulics for clutch operation, gear shifting, braking and steering. The four-cylinder engine with a bore and stroke of 3.07 by 3.94 in. has a displacement of 116.5 cu in. It has a three-bearing crankshaft, aluminum alloy head with hemispherical combustion chambers, and valves inclined at 60 deg. Dual Weber carburetors are used, with each unit feeding four cylinders through a water-heated manifold, the second carburetor coming into operation at nearly full throttle opening. Other features are two coils and double breaker points, an aluminum oil pan, and an eight-blade nylon fan. Compression ratio has been increased to 7.5 to 1 and output is 75 hp



At left—front suspension unit of the new Citroen

Below—new front wheel drive Citroen; air for radiator is admitted below the bumper

By W. F. Bradley
Special European Correspondent for AUTOMOTIVE INDUSTRIES

New Renault model in the Fregate series

at 4500 rpm. Pistons are light alloy fitted with a chromium-plated top ring. The exhaust outlet is carried forward, the gases being led to a pre-expansion chamber before entering the muffler which is mounted transversely across the front of the car. Everything is enclosed beneath, with the exception of the tail pipe attached to the underpan.

A four-speed transmission is provided with synchromesh for the top three gears. The clutch is a conventional single plate dry type, the innovation being in the method of operation. The constant velocity universal joints operate to an angle of 45 deg, giving a turning radius of 18½ ft for a car with a wheelbase of 123 in. The double universal joints at the wheel end are protected by rubber seals. Disk brakes have been adopted for the front, while drums are retained for the rear. The parking brake operates on front wheels. The four wheels are independently sprung, attachment being by tubular trailing arms.

Each wheel has its own suspension unit consisting of a sphere divided into two parts by a rubber diaphragm, one part containing an inert gas and the other having a hydraulic cylinder screwed into it, the piston in the cylinder being connected to the chassis by a suitable linkage. Movement of the piston in the hydraulic cylinder compresses the gases to a greater or less degree and assures pneumatic connection between the wheel and the body.

In operation, hydraulic fluid is delivered to an accumulator incorporating a distributor valve which feeds the suspension system. The circuit passes to an automatic height corrector valve, and from there a single pipe connects to the hydro-pneumatic suspension unit. The corrector valve regulates the pressure in the spring units, thus allowing for vibrations in the load carried. As in the case of the suspension units, the accumulator screwed into the valve body is a sphere containing gas on one side and the hydraulic fluid on the other, the separation between the two being a

(*Turn to page* 138, *please*)

Ambassador Custom four-door sedan has new Jetfire V-8 engine that develops 220 hp

NASH OFFERS WIDE CHOICE of Engines and Transmissions

The Statesman Super four-door sedan is powered by a new 130 hp overhead-valve six-cylinder engine

THE new line of Nash cars will be offered in four horsepower ratings: 220, 145, 135 and 130. Two of the engines—the Ambassador V-8 and the Statesman OHV 6—are new for 1956.

Five models will be offered in the 1956 Nash line. They include the Ambassador V-8 Custom Country Club hardtop, Ambassador V-8 Custom four-door sedan, Ambassador V-8 Super four-door sedan, Ambassador 6 Super four-door sedan and Statesman Super four-door sedan.

All 1956 Nash models utilize a 12-volt electrical system for top ignition performance, higher generator output, and higher cranking speeds.

Still further improvements have been made in the styling of the cars. From the side of the Ambassador's front fender a color spear outlined in chrome trim sweeps back to the rear fender, widening to a modified "V" and then sweeping up and over the rear deck. This allows three-tone paint combinations to be used on the new cars. On the Statesman, a single chrome-trim line is used.

The rear fender area has been restyled and raised 2¾ in. and a massive tail-light assembly has been incorporated. Back-up lights, standard on Custom models, are housed in the new tail-light assembly, as are directional signals, which are standard on all models.

The new Ambassador Jetfire V-8 engine with Twin Ultramatic transmission is rated at 220 hp, compared with 208 in 1955. It develops 320 lb-ft of torque at 2200-2500 rpm. The compression ratio is up to 9.55 to 1, and displacement totals 352 cu in. The V-8 has

GENERAL SPECIFICATIONS—1956

Nash Ambassador and Statesman Series

Engine	Statesman (6-Cyl.)	Ambassador (6-Cyl.)	Ambassador (V-8)
Type	In-line	In-line	V-8
No. of cyl.-arrangement	6, overhead valve	6, overhead valve	8, overhead valve
Bore and stroke (in.)	3⅛ x 4¼	3½ x 4⅜	4 x 3½
Displacement (cu in.)	195.6	252.6	352
Compression ratio	7.44:1	7.8:1	9.55:1
Max. brake horsepower	130 @ 4500 rpm	135 @ 3700 rpm (opt. 145 @ 4000)	220 @ 4800 rpm
Max. torque (lb. ft.)	175 @ 1800 rpm	220 @ 1600 rpm (opt. 230 @ 2000)	320 @ 2200-2500 rpm
Type of carburetor	Down-draft, twin throat	Side-draft, single throat	Down-draft, twin throat
No. of carburetors	One	One (two, optional)	One
No. of main bearings	Four	Seven	Five

larger intake valves and is equipped with an oil filter and oil bath air cleaner as standard equipment.

A new Statesman Typhoon overhead-valve engine, developing 130 hp, replaces the 1955 L-head engine which was rated at 100 hp with a single carburetor and 110 hp with dual carburetors. This new engine has been under development for eight years.

The Ambassador Super Jetfire 6 now develops 135 hp and the optional LeMans Dual Jetfire 6 is increased to 145 hp.

Four transmissions again will be offered. Synchro-mesh transmission is standard equipment on all six-cylinder Nash cars. The case of the Twin Ultramatic has been changed from cast iron to cast aluminum to reduce weight and allow better heat dissipation. Mechanical improvements are said to result in smoother performance.

Dual-Range Hydra-Matic is available on all six-cylinder models. On both Twin Ultra-matic and Hydra-Matic, the Selecto-Lift starting system is used. The shift lever is lifted to activate the starter.

Automatic overdrive, with ignition-key starting, will again be offered.

Front-wheel brakes on the Statesman have been increased from 2¼ to 2½ in. in width, thus increasing total lining area from 155 to 165 sq in. Ambassador brakes have 192 sq in. of lining.

The emergency brake handle has been moved from the right of the steering column to the left and the handle has been changed to a "T" type of design for easier application and release.

All Ambassador wheels have been widened from five inches to five and a half inches and the tire size has been increased to 7.60-15.

Single-unit body construction, reclining seats and twin travel beds, All-Season air conditioning, air intake below the windshield, and Bonderized baked enamel finishes will be continued for 1956.

• • •

FACTS

from Trustees Statement

About Public Sale of Ford Stock

THE Ford Foundation owns more than 88 per cent of all the outstanding stock of Ford Motor Company, but the 3,089,908 shares it holds are shares of non-voting "A" Stock. The right to vote in the affairs of management rests solely in 172,645 outstanding shares of "B" Stock, all of which are owned by members of the Ford family and their interests.

As the result of long study and negotiation, a plan has now been worked out and approved by the Trustees and members of the Ford family under which the family will give up their exclusive right to vote in the affairs of management, and will transfer 60 per cent of the voting rights to a new Common Stock.

The plan involves a reclassification of the stock of Ford Motor Company. Three types of stock are to be issued —a new voting Common Stock, a new voting "B" Stock, and a new non-voting "A" Stock. The three types of stock will have the same interests per share in earnings and assets, but will vary as to voting rights.

There are now outstanding 3,322,-393 shares of non-voting "A" Stock. Of these, 3,089,908 shares are owned by The Ford Foundation, 190,347 shares are owned by members of the Ford family and family interests, and 42,140 shares are owned by 108 key employes of Ford Motor Company as a result of their exercise of employe stock options. (These employes have options to buy in installments over the next three years some 101,000 additional shares.)

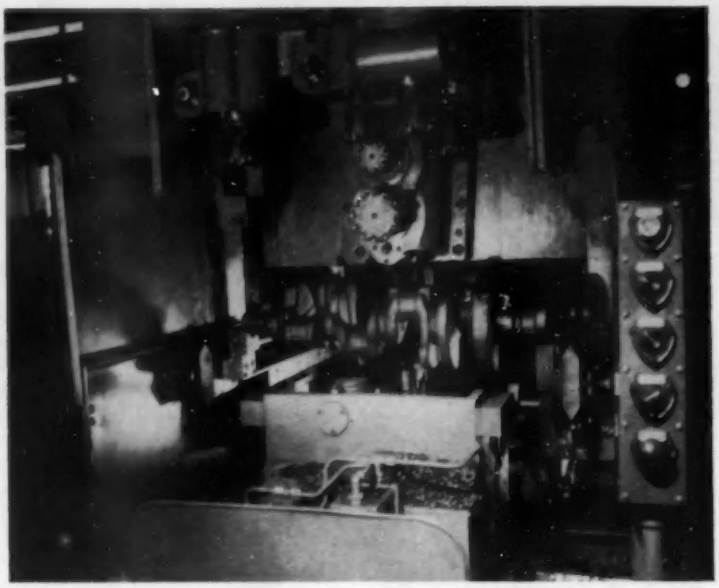
Under the plan, each share of this "A" Stock will be exchanged for 15 new shares. The shares owned by the Foundation will become new non-voting "A" shares, but as any of these shares are sold to the public it is planned to convert them into shares of the new voting Common Stock. The "A" shares owned by Company employes will become shares of new voting Common Stock. The "A" shares owned by members of the Ford family

(*Turn to page* 106, *please*)

PART I

This Is the First in a Series of Articles by the Author Devoted to Plymouth's New Engine Plant. Part II Will Appear in an Early Issue

By Joseph Geschelin



Above is shown massive Fitchburg milling machine, fitted with carbide cutters that handles the first operation on the crankshaft line—milling of locating spots. Cutting is done dry and at right speed. Illustration on next page shows close-up of one of a battery of 10 new Wickes center drive crankshaft lathes. Automatic loading

Completely New Production Methods at Plymouth Engine Plant

THE new Plymouth V-8 engine manufacturing plant on Mound Road in northeast Detroit (see AI, September 15, 1955), marks a definite transition to innovations that may well be the first of their kind to be placed in operation. Aiming at an output of 3000 engines a day when all of the equipment has been placed in operation, the Plymouth plant ushers a new era of manufacturing philosophy. The facility is so extensive that it will require a series of articles to cover even a sampling of highlights. And at this point we should like to touch on some of the "firsts" to which we have referred.

Among the most distinctive are the assembly machines for handling final engine assembly and for making up cylinder head sub-assemblies. These are not assembly conveyor lines in the usual sense: they are Cross Transfermatic machines having the features of a transfer machine line. The transfer conveyor system has intermittent movement with an established dwell to permit the tightening of various fastenings at machine stations.

Engine testing is completely automatic, does not require operator attention, and as developed cooperatively by Plymouth and Nankervis, the movement of engines along the test lines and into and out of test stands has been organized on the simplest and most compact automatic conveyor system devised to date.

For many reasons, including the fact that a crankshaft is a rather unwieldy part, few crankshaft departments have had the benefit of automatic handling in all phases. Plymouth has a crankshaft department that is completely automatic in the present day sense of the term. Equipment such as the battery of Wickes center-drive lathes and LeBlond lathes feature built-in loading and unloading conveyors. The entire network of equipment in this department is served by an installation of Wilson Automation that takes over the transporting of parts from one operation to another.

W. F. & John Barnes Detecto boards, described in AUTOMOTIVE INDUSTRIES recently, are installed on the cylinder head line, serving the important function of simplifying and speeding up trouble-shooting immeasurably on the electrical system of transfer lines. We were told that this equipment fairly well justified its initial cost of installation just during the early tuning of the lines.

and unloading of crankshafts is handled by means of the automation mechanism mounted over the machine. For loading, it picks up work from the elevator mechanism at the right and loads into the work station. After the main bearings have been turned, the device reaches into the work station to remove the shaft, then transfers it to the left where shafts are deposited on another elevator to return to the main automation conveyor in the rear.

Detail of Wilson Automation in the crankshaft department may be seen in this view. In the background is the basic automation conveyor that links the machines on both sides. In the foreground are the elevators that feed individual machines. Rough stock is picked off the conveyor at the lower level, fed to the elevator at the left. Finished crankshafts are raised via the elevator at the right, and returned on the upper level of the main conveyor.

Hydraulic systems blanket practically 95 per cent of major control functions of machines and automation equipment. The remarkable advances due to JIC standards are evident in the rows of Vickers power packages located accessibly along the machine lines.

Another major achievement, conducive to precision work, is the installation of some 61 Aerodyne dry type dust collectors, each capable of filtering 10,000 cu ft of air per minute, the filtered air being returned to the building. Reversing the usual practice, filtered air is drawn by suction downward over the machines and into the underground chip conveyor system in such fashion as to force all dirt and chips underground.

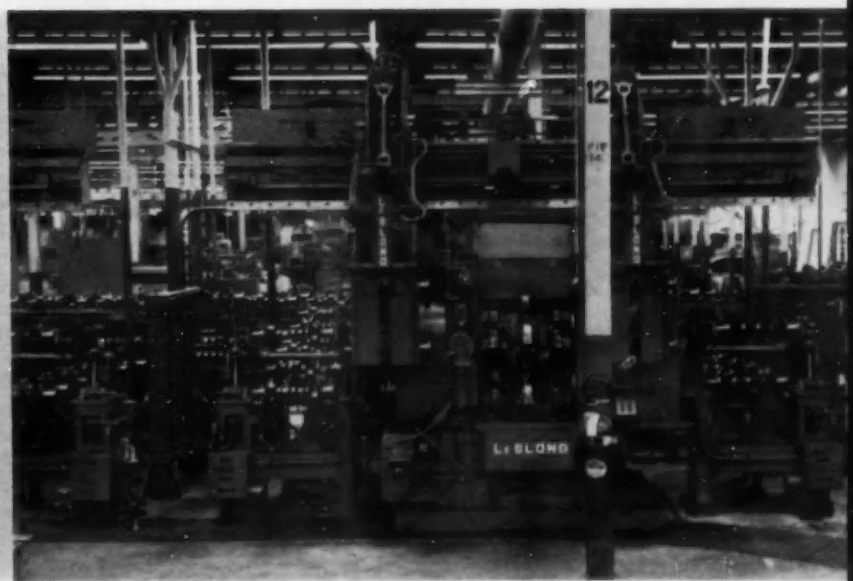
The well known Cross Toolometer consoles, standard

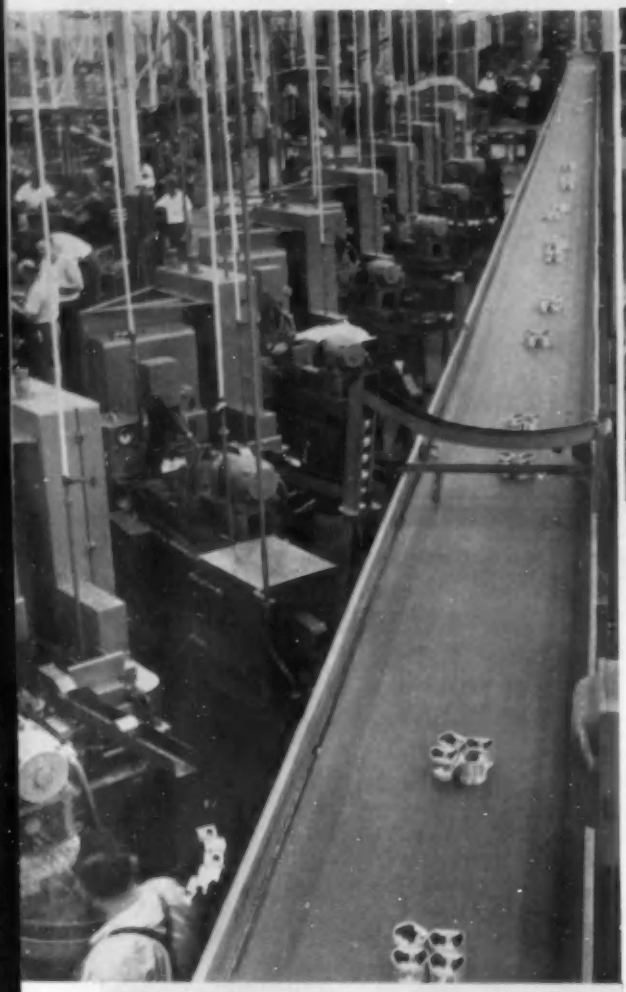
Illustrated

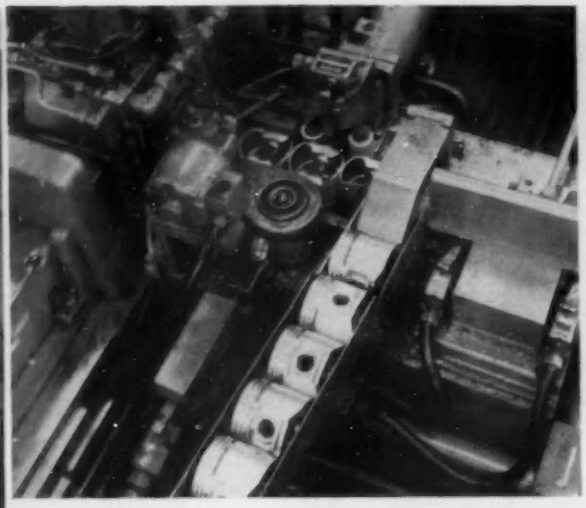
• PLYMOUTH •

CRANKSHAFT PRODUCTION

Perspective of one of the battery of LeBlond crankshaft lathes in the automated crankshaft department. It is an excellent view too of the mechanism for automatic loading and unloading on each side of the machine. Note also the elevator at the right that transports work to the machine; and the one on the left that returns machined shafts to the automation conveyor in the rear.







Overhead view of one of the Heald Bore-Matic machines on the piston line, showing some of the complex of control devices for automatic loading and unloading of the work station.

Illustrated • PLYMOUTH • PISTON PRODUCTION

Above—Long perspective of the Mechanical Handling Systems automation conveyor that links the equipment on the piston machining line. Directly to the left of the wide, 360- ft belt conveyor is the array of part of the impressive battery of 23 Heald Bore-Matics of various types, as described in the text. One of the principal features of the conveyor system is the method of automatic loading and unloading at each machine. This may be noted in the foreground. A deflector moves pistons into a chute that leads to each machine. Finished pistons return to the conveyor by means of an elevator, directed to the opposite side of the belt by the overhead chute. The group of four Baird, first operation machines, is to the left, out of view.

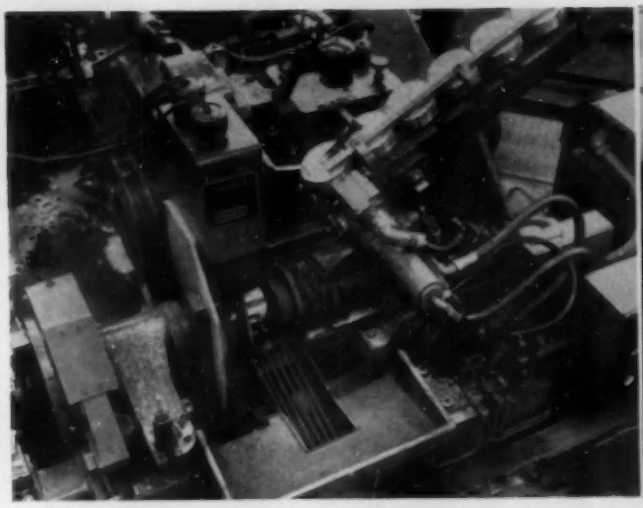
equipment throughout the establishment, serve all transfer machine lines regardless of make.

Plymouth management also has exploited unique vendor relations to the fullest extent, each major department being made the responsibility of a single supplier. For example, the cylinder head line was turned over completely to W. F. & John Barnes. On the cylinder block line—which is considerably more complex—the responsibility was divided between Greenlee, who handled all roughing stages; and Ex-Cell-O who handled the semi- and finish-machining operations. This does not mean that these vendors supplied all of the equipment. Actually, each line features other well known specialists such as Cincinnati, Barnes Drill, Sundstrand, and others. It does mean that in this operation, the prime contractor selected the other cooperating suppliers—including automation by Wilson, J. B. Webb, and Mechanical Handling Systems—and was responsible for the operation of an integrated line.

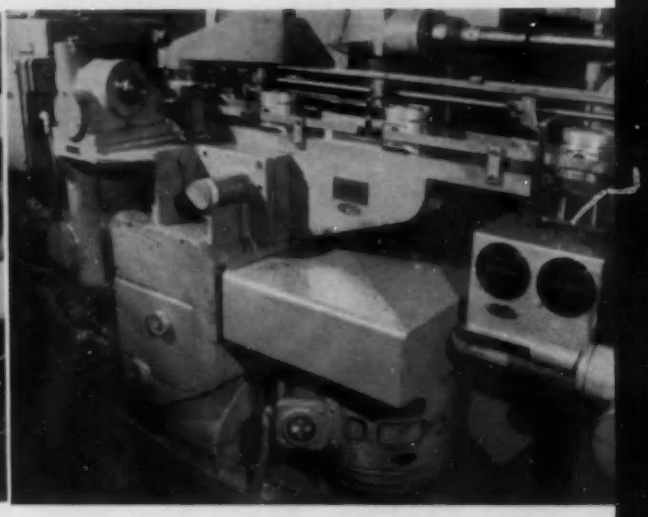
Crankshafts

Consider now some highlights of the machine lines for various components. As noted above, the crankshaft line has been treated to complete automation. Machines are arranged in sequential rows and each row is linked by Wilson Automation, consisting of an upper and lower conveyor line for transporting the work. At each machine the crankshafts are transferred to an inclined conveyor installed at right angles to the automation conveyor, and delivered to the machines by means of a walking-beam movement. Similarly, as the work comes out of the machine it is ejected onto another cross-feed elevator for return to the other level of the automation conveyor.

Needless to say, the action of transferring work



Here is a view looking down on the work station of one of the battery of Cincinnati cam grinders for grinding piston skirts. In the center is the mechanism for feeding pistons automatically from the chute that leads from the automation conveyor. Directly over the work station is the gaging head of the Federal electronic gaging machine which is installed as part of each of the grinders.



Partial view—forward end—of the special Morris weight mill transfer machine on the piston line. Pistons are received automatically at the extreme left, are rough-milled, then automatically weighed at the Shadograph station at the right. At the next major station to the right pistons are finish-milled to uniform weight and checked for final weight at the exit end.

from the feeder conveyor to an elevator or the reverse action of returning the machined part to the feeder line is precisely controlled by automatic means. Thus, if the elevator to a machine is still fully loaded, the automation conveyor will not attempt to feed it. Similarly, the elevator from the machine will not attempt to return the work to the feeder line for the next operation until there is a vacant fixture on the automation conveyor.

First basic operation on the line is the milling of all locating spots in a massive Fitchburg mill, using carbide milling cutters, and cutting dry at high speed.

A battery of 10 Wickes center-drive lathes of latest design has been installed for the turning of main bearings. As illustrated, each machine is provided with built-in automation for loading and unloading. The conveyor for loading picks the crankshafts, one at a time from the feeder conveyor, and loads them into the machine. When the machining cycle has been completed, the unloading conveyor on the opposite side of the machine removes the part from the machine, transports it to the elevator and deposits it onto the fixture.

Cheeking and turning of pins is done in a smaller battery of familiar LeBlond crankshaft lathes. These are fitted with the automatic loading and unloading device pioneered by LeBlond many years ago, the method of loading and returning work to the automation conveyor being the same as outlined above.

Drilling of oil holes in crankshafts is performed automatically in a special transfer machine of extremely compact design developed by Snyder. The machine is built in four sections, on each side of the transfer conveyor. Each section contains four spindles, three for drilling, one for automatic inspection. Thus, there is a maximum capacity of 24 spindles for drilling and eight for inspection.

A battery of Landis IW grinders is employed for grinding of pins and main bearings, diameters being held to a tolerance of 0.0005 in.

Prior to finish-grinding, the drilling, countersinking, and reaming of holes in the flange at both ends is done in a large, horizontal Buhr trunnion type machine.

Pistons

Piston machining is completely integrated and handled with automation, employing a system installed by Mechanical Handling Systems. As illustrated, the line of equipment is served by a wide conveyor belt, running some 360 ft from the first operation to the automatic tin plating system installed by F. B. Stevens. Parts on the conveyor belt feed to the individual machines by means of deflectors which feed chutes leading to the automatic loading station. After machining, the pistons are unloaded automatically from each machine, return to the belt by means of an automatically operated elevator mechanism.

Besides the functions of automatic loading and unloading and automatic machine cycles, automatic precision gaging has been applied at various stations along the line, within certain machines, and at final acceptance at the end of the line.

First major operation on the piston line is processing through a group of four Baird six-spindle automatic chucking machines, for the following operations:

This is a special Bodine automatic assembly machine for fitting rocker arms with screws. The operator loads the rocker arms into the fixtures, the machine does the rest—including feeding of screws from the sides, as shows, as well as tightening them.

One of the numerous special machines installed by Buhr, this one is a multiple-head, multiple-spindle unit for completing a group of operations on rocker arms. As seen here, the work is loaded by hand into fixtures on the indexing table.

rough- and finish-turn ring lands, semi-finish skirt diameter face to length, finish-turn ring grooves.

Noteworthy feature of the piston line is an impressive row of 23 Heald Bore-Matics arranged in four sections. The first group of four machines mills two slots in oil ring grooves. The second group, comprising five machines, rough-bores the piston pin hole, finishes the lock ring groove, chamfers the bore and gages the pin hole. The third section, with three Healds, mills the valve clearance on both sides of the piston head. The last section, containing 11 Heald Bore-Matics, handles precision-boring of the piston pin hole, automatically gaging for size, holding tolerance to 0.0003 in. It is of interest that gaging on Heald equipment is done with Pratt & Whitney Air-O-Limit gages mounted directly on individual machines.

The elliptical contour of the skirt is ground to form and size in Cincinnati cam grinders, fitted with an installation of Federal electronic gaging equipment that gages automatically during the machine cycle.

Final operation is weight milling to produce pistons of uniform weight. This is done in a special Morris transfer machine of multiple-station design. Here the piston is pre-milled or rough-milled, weighed automatically in a Shadograph station, then finish-

AMA Booklet Points Out Tax Bites Less on Cars

Reductions in excess profits taxes last year had a noticeable effect on the total taxes paid on a new automobile. The 35th annual edition of "Automobile Facts and Figures," just published by the Automobile Manufacturers' Association, shows that taxes took 24 cents out of every automobile dollar in 1954, compared with 28 cents in 1953.

Estimated taxes accrued on materials, parts, and their transportation prior to receipt by the automobile manufacturer on a $2,000 car amounted to $113.72, compared with $150.40 in 1953. Income and other taxes (excluding Federal excise taxes) paid by the car maker dropped from $137.97 to $110.23 on a similar priced automobile.

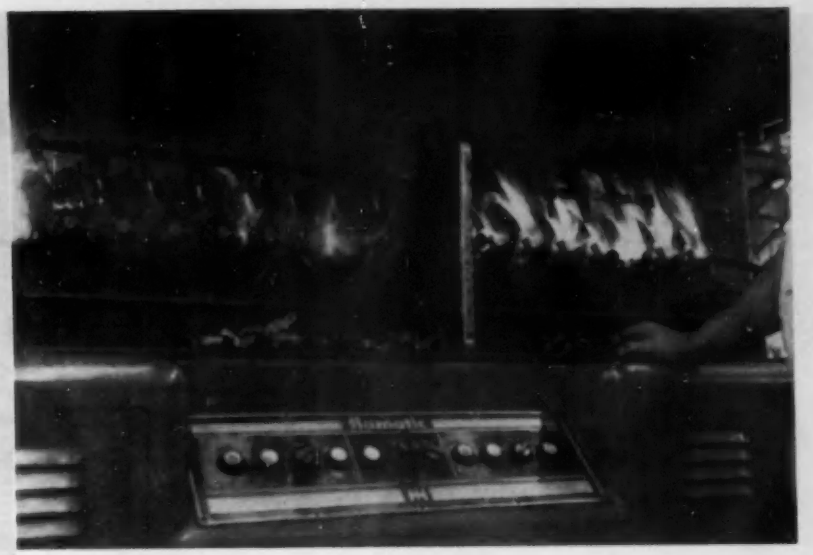
Other interesting data contained in the annual AMA statistical handbook shows that there were 61 million registered motor vehicles and 72 million licensed drivers in the U. S. Special automotive taxes paid by motorists in 1954 amounted to $6.2 billion.

A special section devoted to highways shows that inadequate roads are costing motorists more than $5 billion a year and that $101 billion will be needed for highway construction during the next 10 years. The booklet also notes that 71 per cent of the nation's families own at least one car, while about 12 per cent of car-owning families own two or more automobiles.

Illustrated

• PLYMOUTH •

ROCKER ARM PRODUCTION



Close-up of special Cincinnati Flamatic machine for hardening rocker arm tips. It holds 16 pieces at a time — a full engine set.

milled, and given a finish-weigh for its acceptance.

Final inspection is made in an impressive Sheffield gaging machine that checks automatically the groove width, groove diameter, land diameter.

After tin-plating, the pistons go through another Sheffield gaging machine for sizing skirt diameter and sorting into five grades. Total tolerance allowed on the skirt diameter is 0.0025 in., grading being made into five sizes, in steps of 0.0005 in.

Rocker Arms

Rocker arms are prepared in a small area, using a variety of operations, including American and La-Pointe broaching machines for the shaft hole; Davis-Thompson Roto-Matics for milling the pad radius; and Buhr drilling machines. It may be noted that Buhr has supplied a large number of special machines of various types for this plant. One example on the rocker arms is a special vertical drilling machine of multiple head type for drilling the oil hole; drilling and counterboring, reaming and tapping the adjusting screw hole. Trunnion type Buhr machines on both intake and exhaust rocker arms produce the following series of operations automatically: drill shaft hole, chamfer shaft hole, drill oil hole and ream shaft hole.

An interesting item of equipment in this area is a special Cincinnati Flamatic machine for hardening the rocker arm pad. Here the machine is arranged to hold 16 rocker arms—a complete engine set—at a time.

Mention was made earlier of the chip disposal system. The plant has 22 conveyors in the underground chip drag system with a total length of some 5200 ft, the system having a capacity of 120 tons of chips per day. Cast iron chips are handled separately since they are dry and can be automatically hoppered directly into gondola cars. Chips from the steel operations, on the other hand, must be handled together with cutting fluids, thus requiring special arrangements.

The plant has 11 separate coolant systems with a total capacity of 12,050 gpm. Settling time in the systems varies from six to 10 minutes depending upon the type and size of chips. Chips are removed from the settling tanks by chip drag conveyors.

Bridgeport Brass Marks Success at Adrian Unit

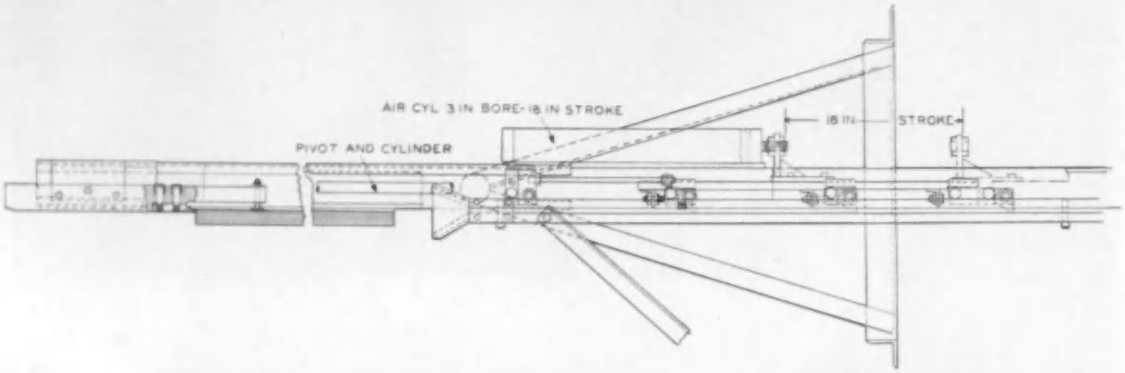
The story of how Bridgeport Brass Co. turned a financially shaky plant at Adrian, Mich., into a money-maker was told recently during a three-day celebration commemorating the event. When Bridgeport Brass took over the big Air Force aluminum plant in December, 1953, observers labeled it a "white elephant."

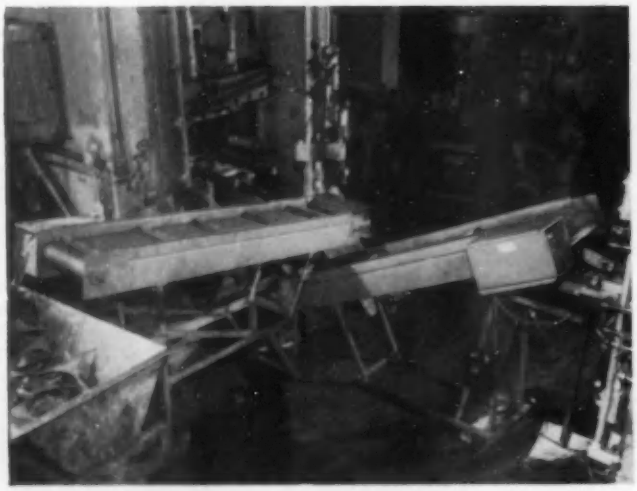
By applying some of the basic management-labor principles it has used successfully at its other plants, Bridgeport Brass broke the profit barrier at the Adrian plant 13 months after it placed it into operation. It realized its first profit in July, as a matter of fact.

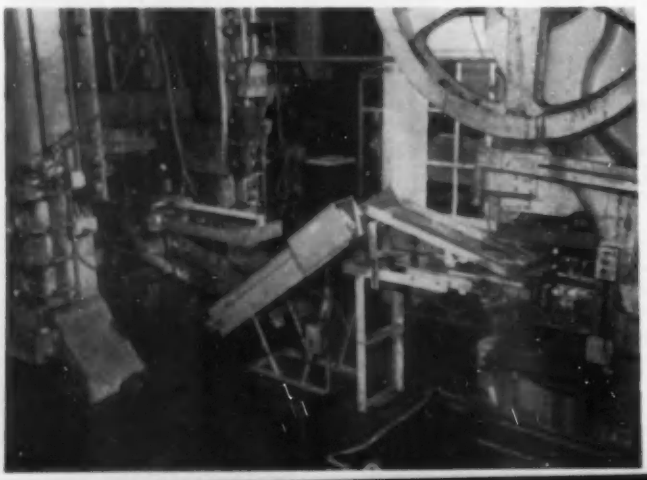
When the company took over the plant, its monthly losses totaled nearly $2 million, with more than 50 per cent of production lost in scrap. That loss was reduced to $15,000 last May, basically through a new program consisting of 1) selective selling; 2) more production per manhour; and 3) more efficient scheduling.

At the start of the three-day celebration, Herman W. Steinkraus, company president, predicted bright prospects for the plant, which is now playing an important part in the Air Force's extrusion and heavy press program. Among future plans are construction of an aluminum rolling mill which will eventually double employment from the present force of 700 persons.

. . . Automatic Production Line







USING a lot of ingenuity to develop automatic feeding and unloading equipment, Buick engineers at Flint together with the City Tool Corp., Dayton, Ohio, have developed an integrated press transfer line from three standard presses. This line turns out about eight Dynaflow pump covers every minute.

The automatic transmission pump covers are approximately 14½ in. in diameter, and the stock is 0.250 in. thick. Steel utilized is SAE 1008. Sheets used in the automated line are 15⅛ in. wide and 60¼ in. long. Four pump covers are made from each piece of sheet stock.

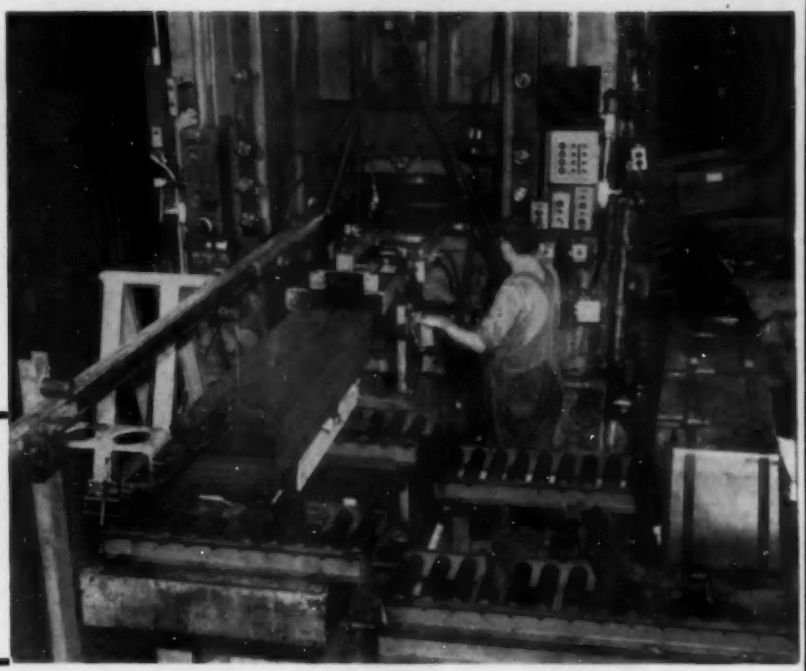
For the operation of the automation mechanisms, Buick has used seven air cylinders and 31 limit switches together with the cleverly designed structural and mechanical units.

In addition to the automatic air-

Upper left—Sheehan portable inclined conveyors at the back of the first press.

Immediate left—automatic handling devices between the second and last press.

for Dynaflow PUMP COVERS



At left—details of the auxiliary and main feed for the first press operation.

At right—feed mechanism for the first press operation on the Dynaflow pump cover production line. The auxiliary feed is shown in the left foreground.

operated load and unload mechanisms, the company has made a unique layout from an assemblage of Sheehan portable conveyors. By this procedure, the integrated line has been made highly flexible even though it is fully mechanized.

Stock, cut to size and in stacks, comes to the initial feed mechanism via roller conveyor at a right angle to the press line. This stack of raw material is manually pushed into place on another roller conveyor to the rear of the main press feed.

An auxiliary feed device operated in conjunction with the main press feed loads sheet steel into the press feed unit. The auxiliary feed is operated by a three in. bore and 78 in. stroke air cylinder. A finger, attached to an arm which is actuated by the air cylinder piston rod, pushes one piece of steel plate through a pair of guides into the main press feed mechanism. As the main feed is loaded, the roller conveyor containing the stack of raw material is automatically elevated so the stock is at the proper height for the auxiliary feed finger to engage the next piece of material.

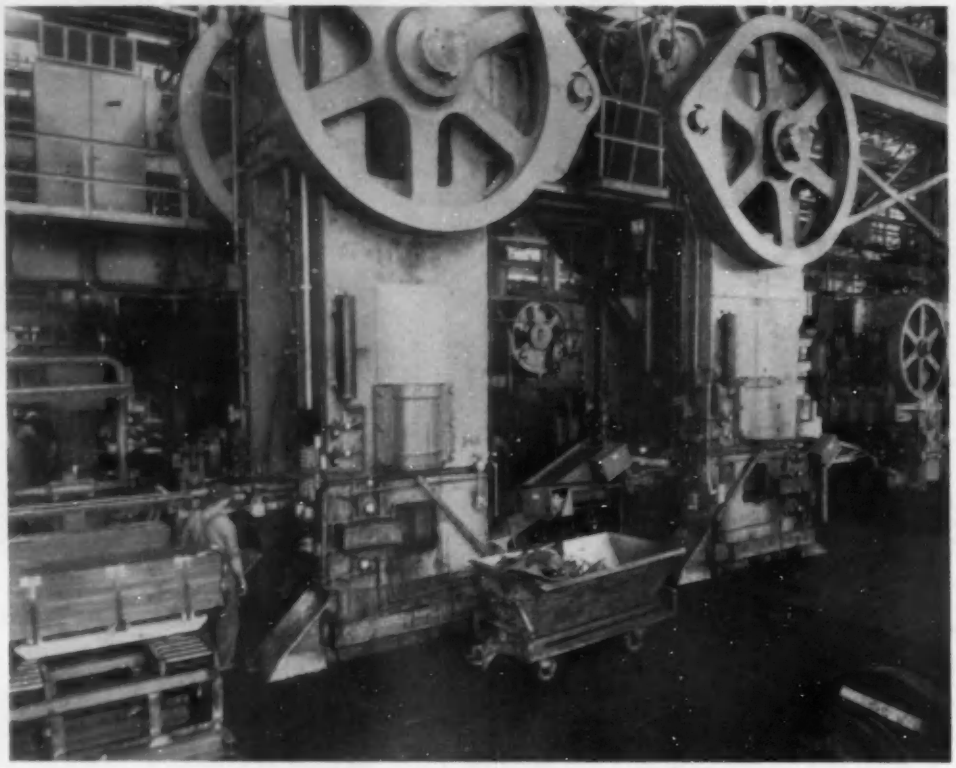
There are four equally spaced fingers on each side of the main press feed unit. These fingers insert the work into the die after each upward stroke of the press. Therefore, each piece of stock is made into four pump covers before the auxiliary unit feeds another piece of steel to the main loader. The entire operation is cycled by means of limit switches.

After the part is stamped and pierced in the first Cleveland 1500 ton press, mechanically-operated fingers on each side of the die carry it out of the press and drop it down a chute onto an inclined conveyor. Scrap at the same time is brought out on a tray and is deposited on another inclined conveyor which has been placed transversely with the press line. Scrap is then dumped into a tote box. Pump covers in the interim travel up the inclined conveyor to the second press loading mechanism.

As the pump cover slides down the chute to the second press operation, it drops through a hole in the chute into a recess in the feed unit. The workpiece rests on guide rails and is pushed along by a rectangular steel plate powered by a three in. bore and 28 in. stroke air cylinder. When the pump cover reaches the end of the guide rails, it falls free into the die cavity. Following a drawing operation in the Cleveland 1500 ton press, the part is removed by a finger on the end of an air cylinder piston-rod located at the rear of the press. This finger slips into the center hole of the workpiece and drags the work out of the die and over a guide. The cover, upon reaching the end of the guide free falls about 18 in. to a chute which in turn places it on an inclined conveyor.

At the top of the inclined conveyor, the pump cover is placed on another chute. A hole slightly larger in diameter than the pump cover has been cut in the low end of the slide. Workpiece, dropping through the hole, is automatically positioned in the loading unit.

A steel plate actuated by a two in. bore, 24 in. stroke air cylinder pushes the work along supporting rails which also act as guides. The supporting rails are cut away at the die cavity for the workpiece to fall in place. For this final operation on the pump cover, a



Overall view of the Buick Dynaflow pump cover production line. The first two presses are Cleveland 1500 ton units while the last press, far right, is a Cleveland 60 ton unit.

60 ton capacity Cleveland press is used to pierce the center hole to desired size. The slug is removed at the side of the die and dropped into a tote box. Finished pump covers are removed from the press by a method similar to that used at the second press. An air cylinder (two in. bore by 24 in. stroke) piston-rod has a finger attached that drops into the center hole of the cover.

• • •

Gear Quality and Dimensions Discussed at AGMA Meeting

ACTIVITIES of its many working committees highlighted the American Gear Manufacturers Association Semi-Annual Meeting held in Chicago late last month. Executives and engineers from a large number of the country's commercial manufacturers of gears, so-called captive gear shops, and gear cutting machine builders gathered for a three-day meeting, presided over by M. R. Anderson of Michigan Tool Co.

Two papers were presented, "Gear Heat Treating Techniques," by Norman Kates, chief metallurgist for Lindberg Steel Treating Co., and "A Torque Converter in Power Transmissions," by P. L. Fosburg of the Hydraulic Drives Dept. of Westinghouse Electric Corp.

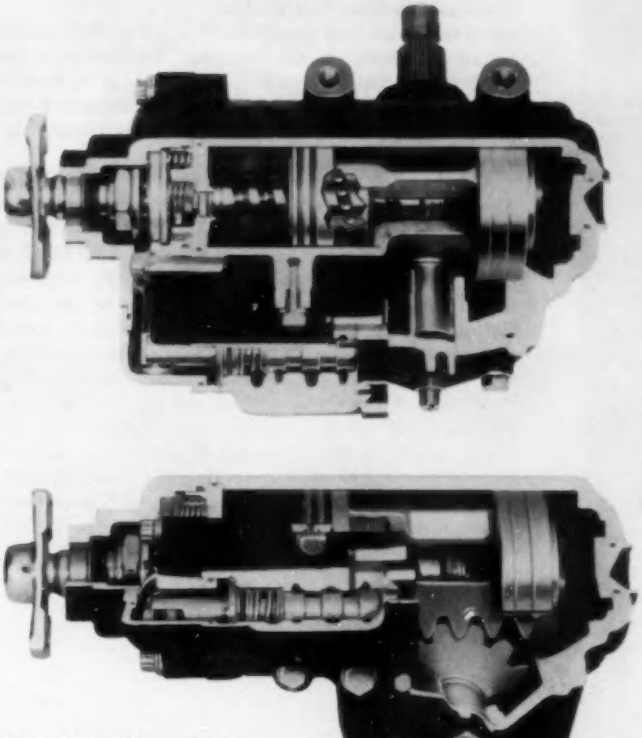
Gear Strength

Three proposed tentative standards for strength of helical and spur gears were introduced by the Gear Rating Coordinating committee. These standards introduce the factors of statistical evaluation of stress values, as well as heat treating quality. The graphs in the standard offer the gear designing engineer a selection of curves from which he can choose based on the use of the gear, past experience and so forth. The next step of this and other committees will be to offer a test of these formulas in practice.

General Standards

Under the General Gearing Div., the Aircraft committee reported that its draft on engine bevel gears is nearly finished and will be reported at the spring meeting. Aircraft gearing is to be divided into four new groups: engine and power takeoff, actuating, control, and short-life rocket and missile gears. The Automotive committee announced its proposed standard practice will be reported at the spring meeting. Fine Pitch com-

(*Turn to page* 188, *please*)



Part-cutaway views of the new Saginaw hydraulic steering gear

SAGINAW INTRODUCES *New* *Integral Power Steering Gear*

By C. W. LINCOLN, *Chief Engineer,*
SAGINAW STEERING GEAR DIV., GMC

A NEW hydraulic steering gear which will be used in all 1956 General Motors makes, except Chevrolet, as well as in other makes of cars is now in full-scale production at Saginaw Steering Gear Division of General Motors Corp. The new gear, which is radically different in design from that of the past year, has been undergoing intensive development, including hundreds of laboratory tests and many thousands of miles of road testing, for the past 12 months or more.

The 1956 gear retains the re-circulating ball screw and nut characteristic of all Saginaw steering mechanisms, but apart from this bears practically no resemblance to its predecessor. The re-circulating ball nut is fixed in a part called the piston-rack, and the latter part, as its name implies, serves both as the hydraulic piston and as the rack, which meshes with the sector teeth of the pitman shaft.

The piston-rack moves back and forth in a smooth bore of the housing casting, so that the steering gear housing itself serves as the hydraulic cylinder. The re-circulating ball screw is mounted in a small needle bearing near the top of the gear, and the thrust of the screw is taken by a specially designed ball thrust bearing. This bearing includes a novel system of centering springs so that the screw is fixed in a "neutral" axial position when the loads on the gear are light. The bearing permits a limited amount of axial movement of the screw, however, as loads of any consequence are encountered. Axial movement of the screw is transmitted by means of a unique lever to the hydraulic control valve, which is in neutral position when the loads are light, but directs pressure oil to one side of the piston or the other as the slight axial shift of the screw takes place.

The housing for the control valve is a small separate casting fastened to the steering gear housing proper. Hydraulic reaction is exerted directly on the valve spool itself, so that the separate reaction plungers formerly used are no longer required. All oil passages within the valve and the gear are internal; this means that only two hose connections are required, one for the pressure line from the pump, and one for the return line.

With many of the gears, the screw is comparatively short, projecting only a short distance from the top of the gear. In this case the driven yoke of a flexible disk coupling is fastened to the upper end of the screw. The driving yoke of the coupling is fastened to the lower end of the steering shaft proper, which is enclosed within a jacket in the driver

(*Turn to page* 146, *please*)

Louis Polk, chairman and president of the Sheffield Corp., has been elected President of the NMTBA

High Machine Tool Sales Foreseen at NMTBA Meeting

By Thomas Mac New

FROM all indications reported by executives of machine tool companies attending the 54th annual meeting of the National Machine Tool Builders Association last month in New York, 1956 should be an extremely productive year for machine tool builders. Although there is a great amount of activity at present in machine tool orders, it is anticipated that the first half of 1956 will show an extremely high sales index.

A feature of the meeting, at which 90 per cent of America's machine tool capacity was represented, was the annual election of officers. For the 1955-56 term Louis Polk, chairman and president of The Sheffield Corp., was elected President. Tel Berna, who has served for 18 years as General Manager of the association, was elected Executive Vice President. Other officers include Jerome A. Raterman, president, Monarch Machine Tool Co., First Vice President; Alfred V. Bodine, president and treasurer of Bodine Corp., Second Vice President and Director; Perrin G. March III, president of the Cincinnati Shaper Co., Treasurer. During the course of the meeting, Frida F. Selbert, who served the better part of 35 years as Secretary of the society, announced her retirement. William E. Rutz, executive vice president, Giddings & Lewis, who is currently a Director of the association, was elected Secretary of the association for the 1956 term. New directors elected, in addition to Mr. Bodine, were Ralph E. Cross, executive vice president and secretary of the Cross Co.; Charles S. Davis, Jr., vice president, Lake Erie Engineering Corp.

INTERESTING show facts pointed out by William E. Rutz: There were 917 individual machine tools in the show which had a total weight of 8880 tons, and it required 152 freight cars and 1200 trucks to transport the equipment. The peak power load during the show was 9400 hp, the approximate equivalent of 7000 kva. Total registration was about 103,000. There were approximately 1000 visitors from Canada, 195 from England, 141 from France, 126 from Germany, and 124 from Mexico. Expense of the show was approximately $875,000, excluding exhibits

The opening address of the meeting was given by M. A. Hollengreen, president, Landis Tool Co. and the 1955 president of the association. He told the machine tool builders that the machine tool show represented only the opening gun of an all-out sales campaign, since there are still many thousands of machine-tool-buying personnel who did not see the Chicago exhibit. Mr. Hollengreen also stated that he is expected to testify before the subcommittee on economic stabilization of the Congressional Joint Committee on the economic report. The subject under investigation is automation. As he brought out, the investigation does not concern a piece of machinery; it is really whether technological advancements in production put men out of work. Mr. Hollengreen feels it is necessary for

(*Turn to page* 162, *please*)

Increase of 5.7 Per Cent Forecast for 1955 Motor Vehicle Registrations

By Marcus Ainsworth

MOTOR vehicle registrations for 1955 will number approximately 61,309,000—an increase of 5.7 per cent over the 58,020,370 registered during 1954. In addition to these 61.3 million fee-paid registrations there will be around 725,000 Federal, State and Local Government vehicles.

Of these 61,309,000 vehicles 51,025,000 will be passenger cars and taxicabs, an increase of 5.9 per cent over the 48,167,554 registered during 1954. Trucks and buses will number 10,284,000, a gain of 4.4 per cent over the 9,852,816 registered in 1954.

(*Turn to page* 166, *please*)

Forecast of 1955 Motor Vehicle Registrations

As of the end of the 1955 registration year

State	Passenger Cars [1] 1955	Passenger Cars [1] 1954	% Gain	Trucks and Buses 1955	Trucks and Buses 1954	% Gain	Total Motor Vehicles 1955	Total Motor Vehicles 1954	% Gain
Alabama	707,000	667,670	10.2	175,000	168,000	4.2	882,000	835,670	5.5
Arizona	338,000	330,383	2.6	33,000	32,075	2.9	365,000	371,439	6.2
Arkansas	380,000	365,200	4.0	170,000	173,177	4.0	550,000	537,377	4.0
California	5,300,000	4,935,457	7.4	740,000	672,540	10.0	6,040,000	5,608,468	7.7
Colorado	540,000	520,212	3.8	137,000	132,200	3.1	667,000	677,402	3.9
Connecticut	760,000	727,651	4.5	100,000	105,402	5.0	860,000	834,053	4.1
Delaware	113,000	104,745	7.9	29,000	30,062	3.7	142,000	134,795	5.6
District of Columbia	173,000	169,500	2.0	22,000	21,500	2.3	195,000	190,995	2.1
Florida	1,320,000	1,193,000	11.4	333,000	317,500	5.0	1,653,000	1,491,773	10.7
Georgia	900,000	882,991	7.0	234,000	226,410	3.4	1,134,000	1,121,105	6.1
Idaho	230,000	224,000	5.0	30,000	31,051	4.5	260,000	255,051	5.5
Illinois	2,540,000	2,426,544	6.6	660,000	630,000	4.7	3,197,000	3,079,550	5.4
Indiana	1,400,000	1,360,971	2.9	290,000	294,475	2.8	1,700,000	1,661,446	2.9
Iowa	923,000	902,931	2.8	211,000	205,275	2.8	1,167,000	1,127,105	3.9
Kansas	800,000	762,940	6.6	232,000	241,067	4.3	1,081,000	1,000,000	6.8
Kentucky	650,000	702,910	7.0	211,000	193,175	6.1	1,017,000	944,085	7.7
Louisiana	725,000	688,944	5.8	195,000	190,000	3.9	975,000	878,944	5.4
Maine	287,000	280,026	2.5	75,000	72,537	3.4	327,000	311,237	5.0
Maryland	705,000	701,201	2.9	192,000	187,000	2.7	915,000	879,067	4.1
Massachusetts	1,340,000	1,301,000	4.7	131,000	170,000	6.0	1,520,000	1,471,105	5.7
Michigan	2,671,000	2,492,135	5.2	360,000	332,710	1.6	2,930,000	2,730,343	7.4
Minnesota	1,114,000	1,055,047	5.5	257,000	235,000	4.0	1,302,000	1,272,200	5.0
Mississippi	600,000	555,577	6.3	192,000	192,671	1.1	692,000	672,000	4.0
Missouri	1,300,000	1,237,000	3.2	300,000	305,455	1.6	1,470,000	1,422,000	3.3
Montana	230,000	212,204	6.1	97,000	91,007	4.2	327,000	288,401	5.0
Nebraska	490,000	480,395	2.0	145,000	140,700	6.6	635,000	620,863	2.4
Nevada	82,000	80,700	6.9	37,000	39,200	7.1	119,000	111,900	5.1
New Hampshire	170,000	162,705	4.4	37,000	35,120	5.3	207,000	197,475	4.8
New Jersey	1,600,000	1,500,403	7.0	330,000	332,475	0.6	1,930,000	1,891,500	7.0
New Mexico	240,000	235,400	5.7	67,000	70,404	95.0	332,000	305,804	8.2
New York	5,000,000	4,707,000	4.6	600,000	663,440	2.5	4,600,000	5,371,440	4.2
North Carolina	1,100,000	1,027,623	7.8	201,000	249,139	4.3	1,301,000	1,276,762	6.1
North Dakota	204,000	201,000	1.2	84,000	82,210	1.2	288,000	284,105	1.9
Ohio	3,000,000	2,807,401	6.8	460,000	433,000	4.3	3,460,000	3,241,471	6.4
Oklahoma	760,000	709,757	6.8	230,000	241,000	5.5	1,000,000	950,700	6.2
Oregon	720,000	697,210	5.2	80,000	76,000		800,000	773,200	4.6
Pennsylvania	3,320,000	3,000,000	6.1	670,000	692,207	4.4	3,990,000	3,692,000	8.0
Rhode Island	205,000	200,000	2.5	75,000	80,110	2.3	280,000	280,110	5.4
South Carolina	595,000	552,007	6.8	154,000	159,326	5.3	750,000	691,333	6.9
South Dakota	240,000	230,000	4.3	45,000	41,000	3.0	285,000	270,810	5.6
Tennessee	940,000	903,927	3.8	210,000	210,000	3.1	1,150,000	1,100,000	5.3
Texas	3,200,000	3,107,000	3.0	742,000	729,100	7.0	3,942,000	3,837,740	5.3
Utah	260,000	246,400	5.1	65,000	57,000	3.0	325,000	303,400	7.3
Vermont	120,000	114,500	4.8	15,000	14,700	6.2	135,000	129,200	4.2
Virginia	1,000,000	960,000	5.0	227,000	208,100	5.7	1,200,000	1,167,204	7.0
Washington	930,000	900,000	7.1	210,000	192,000	10.3	1,140,000	1,092,000	6.5
West Virginia	394,000	365,000	2.1	111,000	112,700	—1.1	505,000	481,000	5.7
Wisconsin	1,110,000	1,000,000	7.4	264,000	256,000	2.3	1,374,000	1,247,000	2.5
Wyoming	102,000	100,000	2.0	31,000	30,127	3.3	133,000	130,000	2.4
Total	51,025,000	48,167,554	5.9	10,284,000	9,852,816	4.4	61,309,000	58,020,370	5.7

[1]—Includes taxicabs.

HEAVY PURCHASES AT METAL SHOW

ONCE again the Metal Show presented the newest and finest products and services of hundreds of important firms. Held last month in Philadelphia, the 37th National Metal Congress and Exposition had an excellent attendance, although no records were broken. Exhibitors reported a better-than-average percentage of buyers among those who were attracted by their displays.

During the annual meeting of the American Society for Metals, the following took office: President, A. O. Schaefer, vice president in charge of engineering and manufacturing, The Midvale Co., Philadelphia, Pa.; vice president, D. S. Clark, professor of mechanical engineering, California Institute of Technology, Pasadena, Calif.; treasurer, C. H. Lorig, technical director, Battelle Memorial Institute, Columbus, Ohio.

The American Society for Metals' Medal for the Advancement of Research was presented to Roger W. Straus, chairman of the board, American Smelting and Refining Co.

Dr. Paul D. Merica, former president, International Nickel Co. and International Co. of Canada was made an honorary member of the American Society for Metals. Dr. Merica is the 22nd to be enrolled as an honorary member of ASM.

Many of the Metal Show exhibits were described in the October 15 issue of AI. Following are descriptions of other displays to supplement those which were published in the earlier issue.

Featured in a large display area occupied by Westinghouse Electric Corp. was a complete new line of welding machines and electrodes. An on-the-spot demonstration of the Westinghouse arc-welding process was given which included an electrode wire gun, control and wire-driving mechanism for inert-gas metal-arc consumable electrode welding. In addition, to powdered iron electrodes, various brazing alloys were also on view.

Across the aisle from the Westinghouse booth, Tocco Div. of Ohio Crankshaft Co. was on hand with its line of high-frequency equipment for brazing, welding, forging, heat treating, annealing, melting, and ultrasonic cleaning. Attracting a great deal of interest was a working automatic setup for hardening automatic transmission parts.

Taylor Dynamometer & Machine Co. introduced its new Model SB speed-button static balancing machine to show visitors. Available in six sizes to handle workpieces up to 60 in. diam, the machine is air-actuated for more production capacity. The company also presented an operating model of its precision drilling machine.

In a nearby booth Sun Oil Co. displayed its line of lubricating and metalworking oils, while a short distance away Pangborn Corp. exhibited operating setups of its Hydrofinish wet blasting cabinet which operates by compressed air and its Blastmaster airless cleaning barrel with a quick-action loading device. The former unit was blasting various types of molds, while the latter was cleaning steel castings.

Also prominent among the many eye-catching live demonstrations at the show was that to be seen at the booth of Ransburg Electro-Coating Corp. The conveyorized demonstration painting of small parts featured a reciprocating disk atomizer to whose center paint is pumped. As the disk rotates rapidly to feed paint to the atomizing edge, high dc voltage is imposed on it to establish an electrostatic field between the disk and the electrically grounded parts hanging on the conveyor. The electrostatic field attracts the paint to the surrounding parts.

Osborn Manufacturing Co. devoted its display space primarily to its new Brushamatic machines. Intended for surface juncture blending, burr removing, and cleaning, numerous finishing operations on gears and similar parts can be performed automatically.

The booth of A. Schrader's Son offered to visitors numerous working exhibits of its pneumatic cylinders. On display also were its extensive lines of pneumatic valves, pneumatic strainers, lubricators, hose and fittings, and pneumatic controls for all types of machines.

Waldes Kohinoor, Inc., presented a varied array of Truarc retaining rings and devices on which they are used, a ring dispenser, and a grooving tool with accessories. Pliers, dispensers, applicators, and accessory tools were also shown.

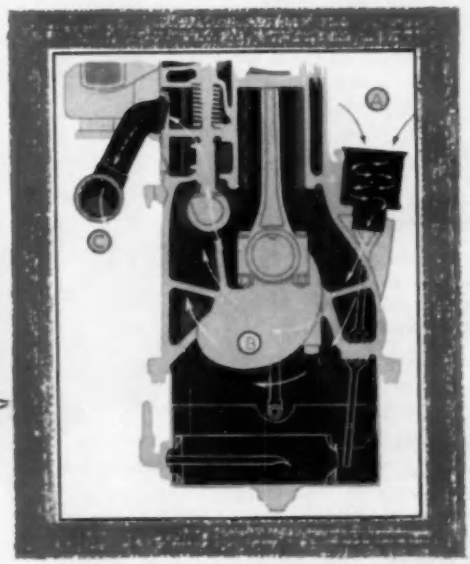
Various types of metals, alloys, and chemicals were displayed in the booth of Vanadium Corp. of America, while National Lead Co. took advantage of the occasion to unveil several new developments. Among these were novel techniques for the finishing of aluminum die castings and other parts, along with new solders and fluxes. Other National Lead items shown included sheet metal forming tools, titanium alloys, zirconium alloys, die castings, metal fasteners, and lead alloy products.

New remote handling equipment for multiple sources of gamma radiation was shown by Budd Co. Philadelphia. Other remote handling equipment for very strong sources of Iridium 192, as well as radiation detection apparatus, was on display, some of it in operation.

One of the main talking points of the Cleveland Punch and Shear exhibit was its new line of underdrive presses. Units of this nature are much sought after in the automotive industries because they lend

(*Turn to page* 194, *please*)

In 1926, AC solved the problem of positive crankcase ventilation and licked crankcase dilution!



High among many notable AC automotive accomplishments stands the AC pioneering method of eliminating "blow-by" gases from the crankcase. Crankcase dilution from that source was stopped, as was the formation of destructive acid. Prevention of freezing of oil passages in winter and serious thinning of oil in hot weather were additional gains.

In the diagram of an Oldsmobile engine (1926) shown at left, you see the AC-pioneered process. A small portion of the carburetor-bound air is drawn in through the Oil Filler Breather Air Cleaner (A) and sweeps through the crankcase (B), picking up water vapor and unburned fuel which may have passed into the crankcase due to engine "blow-by." The air then passes through tube (C) to the engine air intake.

Today, as avidly as in 1926, AC is studying automotive problems. In an industry that never stands still, an AC solution for you may be an equally historical step. Call on us, any time.

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On all Miller Hydraulic Cylinders only

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"TEFLON" Rod Wipers and "TEFLON" Hydraulic Seals withstand temperatures from —100° F. up to 500° F. They are impervious to practically all known chemicals, including the fire-resistant, special, and standard hydraulic fluids in current use.

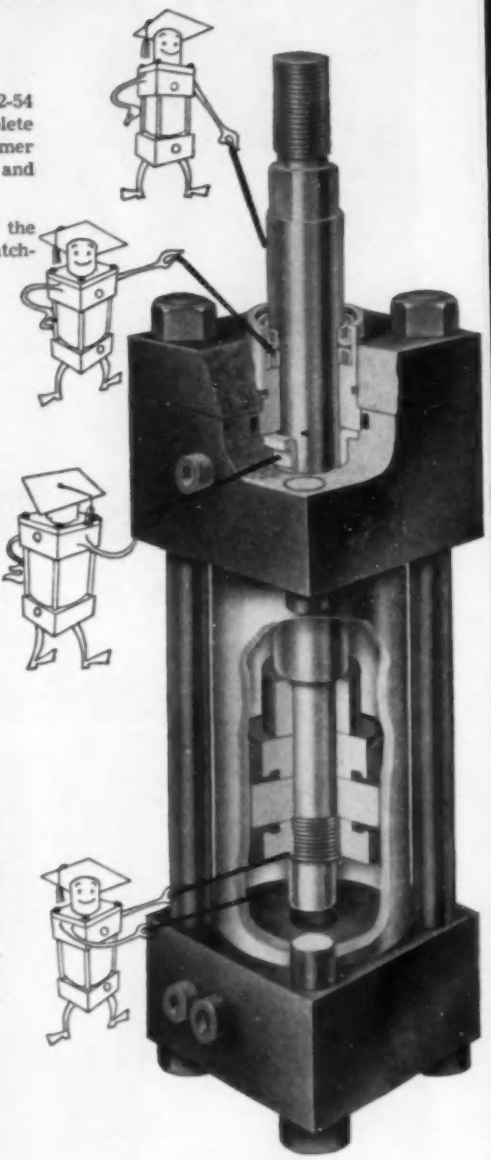
RUST RESISTANT SURFACES

On all Miller Air and Hydraulic Cylinders

Benefits To You

Highest quality Black Ferric Oxide Finish provides rust protection in air cylinder operation and on all cylinders during shipping and installation.

Cylinder heads, caps, mountings, pistons, followers, and the unplated portions of the piston rods have this finish. It is not recommended for water service.



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COUNTERBALANCE CYLINDERS

Four More Miller Firsts . . .

Our "Report To Cylinder Users" was a simple statement of Miller Fluid Power Company's policy. In it was mentioned our dedication to the constant improvement of our products.

In line with this policy, here are new quality cylinder features that will eliminate many of the problems which you have reported to us.

Miller gave cylinder users one of its firsts when we chrome-plated all cylinder piston rods. Our reason was obvious. Chrome-plating gave every rod a mirror-like finish that no corrosive or abrasive dust could scratch. Miller made this chrome-plated, longer lasting rod standard. AT NO EXTRA COST.

Preventing Damage To Piston Rods

There were still plenty of hazards to which piston rods were subjected. A careless workman with a too handy wrench or pair of pliers meant a scored piston rod. A falling object striking the rod dented the softer metal beneath the plating of chrome. A jolt during assembly left its trouble-breeding mark. All of these nicked and scored the piston rods, damaging the whole assembly. Little could be done about this beyond repair and replacement—until the Miller announcement that from now on the piston rods on all cylinders — air and hydraulic — will be specially hardened (52-54 Rockwell C) to foil the carelessly used tool, the accident in transit or assembly, the falling object or unnoticed knock. Naturally, the new hardened rods will still be chrome-plated. Miller will now make this super quality an everyday standard. AT NO EXTRA COST.

Meeting The Challenge Of The New Demands On Seals

Rod seals on Miller hydraulic cylinders were constructed to be leakproof under all ordinary operating conditions. We guaranteed this. But we also stated in all our catalogues that for special conditions there must be special rod seals at an extra cost. Rod seals to withstand high temperatures had to be specially constructed. Where fire resistant fluids were used, special rod seals had to be provided at an extra cost. Because many fire resistant fluids destroy ordinary packing.

The present widespread use of these fluids and excessive heat generation from high speed operation and increased loads have resulted in reports of trouble on cylinders where ordinary seals were subjected to these hazards. These reports were not received with joy at Miller, even when the fault was definitely not ours. We don't like to have trouble develop on any Miller installation under any condition. So we decided to do something about these problems of the rod seals.

A new expensive material known as "TEFLON" has been developed for use as seals. This material is impervious to temperatures from —100° to plus 500° F. It resists all known fluids, even the most destructive of the fire resistant fluids. Now, every piston rod on every Miller hydraulic cylinder will be fitted with "TEFLON" Piston Rod Seals. AT NO EXTRA COST.

In addition, all rod wiper seals on all Miller Air and Hydraulic cylinders will be of the same chemical-and-heat resisting Teflon material.

These Teflon rod wiper seals will be standard on every Miller cylinder, regardless, of how and where it will be used. This is Miller's way of doubly insuring cylinder users against all possible hazards. AT NO EXTRA COST.

Protection Against Rust

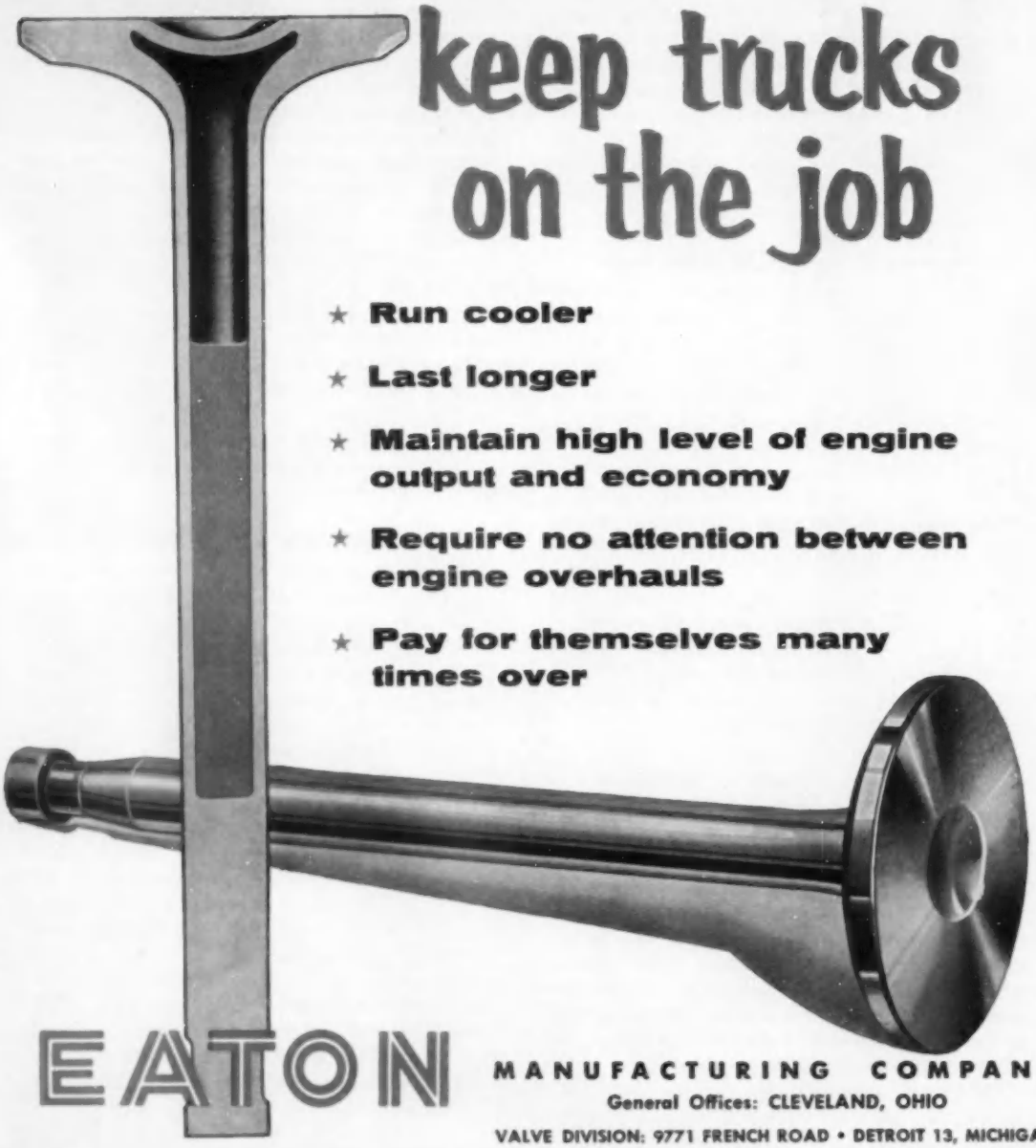
The barrels of Miller air cylinders are of moisture-resistant brass. The barrels of hydraulic cylinders, since they run in oil, are protected once they are installed and in operation. Beyond this all cylinder parts are subject to rust and corrosion. Such exposed parts as heads, caps and tie rods quickly show the unsightly evidences of rust. At least this has been so up till now. But all this is now being corrected.

From now on Miller will protect all these parts on both air and hydraulic cylinders with a black oxide process in which a chemically created ferric oxide coating is developed on the surface of the metal to protect against rust and other corrosion. Every Miller cylinder sold will carry this added protection. AT NO EXTRA COST.

These four new Miller firsts are added to the many firsts established by Miller. Like other Miller firsts which created new departures in cylinder design and construction, these are now offered as Miller standard specifications. AT NO EXTRA COST.

MILLER FLUID POWER COMPANY
2028 N. Hawthorne Avenue
Melrose Park Illinois

Eaton
SODIUM COOLED VALVES keep trucks on the job



- ★ **Run cooler**
- ★ **Last longer**
- ★ **Maintain high level of engine output and economy**
- ★ **Require no attention between engine overhauls**
- ★ **Pay for themselves many times over**

EATON MANUFACTURING COMPANY

General Offices: CLEVELAND, OHIO

VALVE DIVISION: 9771 FRENCH ROAD • DETROIT 13, MICHIGAN

PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

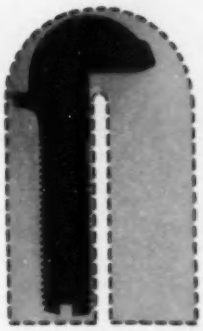
Eight operations cut to four

The old way:

The stud shown here was used by a tank manufacturer to blind feed into a tubing hole during assembly. Multiple diameters were required to hold the stud tight after insertion. To achieve this rather intricate shape, eight operations were originally required . . . until National was asked to study the problem.

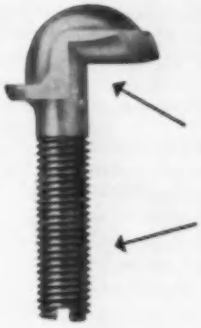
The National way:

Our "Special Products Service" showed this manufacturer how the stud could be produced to specifications *in only four operations* by cold-heading. Because National had the wide range of cold-heading equipment and specialized know-how needed to do the job, production costs were cut 50% . . . and substantial material savings resulted because cold-heading leaves a minimum of scrap.



OLD WAY

Bar stock bent in U-shape was machined to specifications in eight operations, with considerable waste of metal.



THE NATIONAL WAY

Head was upset into shape needed with multiple diameters.

Only four operations needed to complete stud by cold-heading and roll threading.

Bring your "Special" problems to National

Can we help you realize the same type of economy on *your* special fastener needs? Our "Special Products" representative will be glad to study your specifications. Write for free copy of National's "Special" fastener booklet.

Representatives in:
Chicago, Cincinnati, Detroit, New York, Philadelphia, Kansas City, Milwaukee, Rochester, Denver, St. Louis, San Francisco and Seattle.

THE NATIONAL SCREW & MFG. COMPANY
Cleveland 4, Ohio
Pacific Coast: National Screw & Mfg. Co. of Cal.
3423 South Garfield Ave., Los Angeles 22, Cal.

MANUFACTURED TO NATIONAL PHILLIPS SCREWS

National PRODUCTS

Fasteners Hodell Chains Chester Hoists

New Farval spray panel lubricates gearing automatically, efficiently, inexpensively

FARVAL—
Studies in Centralized Lubrication
No. 183

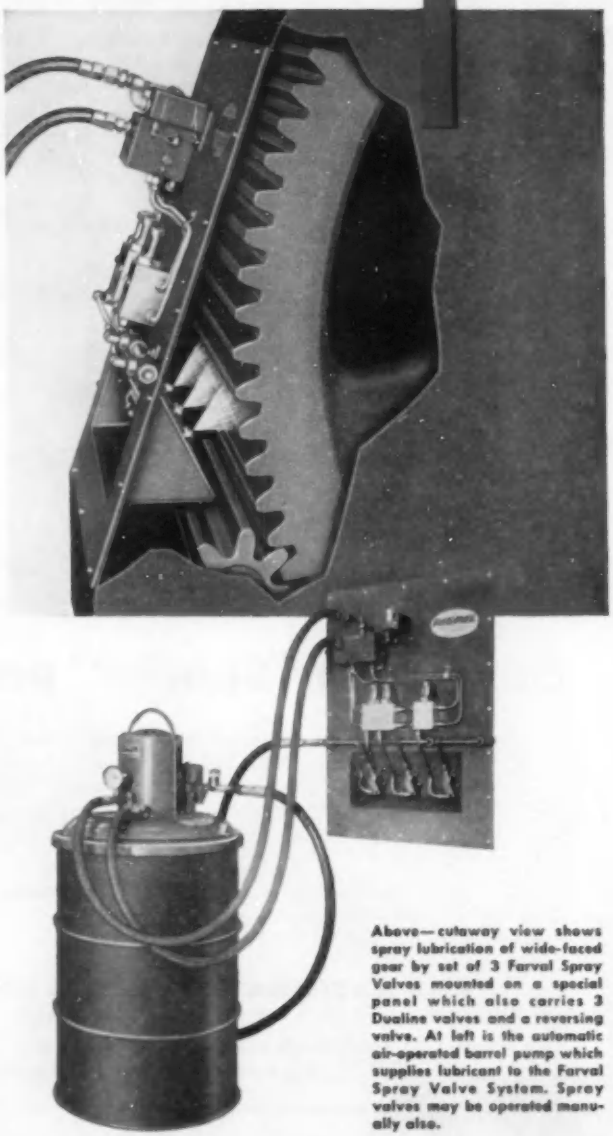
HERE'S how to do a better job of greasing gears and save a lot of lubricant and labor besides. Just install Farval Spray Valves. They can reduce oil and grease consumption and oiling labor as much as 95%. Then you can throw away the oil can and grease bucket, and put your oilers on other constructive work.

Shown at right is a new Farval Spray Valve System developed for large-diameter wide-faced gears. Installed on a panel mounted on the gear housing are Dualine valves, spray valves and reversing valve. An automatic air-operated barrel pump supplies the lubricant.

Farval Spray Valves are completely flexible as to arrangement and operation. They can be used alone or as part of a Dualine System—wherever a supply of compressed air is available. As with standard Dualine valves, the spray can be operated as often or as infrequently as needed to deliver any desired amount of oil or grease, on gears, sliding bearing surfaces or other areas needing lubrication. There is no waste or mess. Quantity of air used is limited to the exact amount required to spray each delivery of oil or grease.

Hundreds of Farval Spray Valve Systems are now in use in many industries. Why not investigate this simple, inexpensive method for your own plant equipment? Tell us the type of gearing or machines for which you would consider automatic spray lubrication. One of our field representatives will be glad to recommend the Farval system best suited to your needs. Write for Bulletin 26-R. The Farval Corporation, 3296 East 80th Street, Cleveland 4, Ohio.

Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing. In Canada: Peacock Brothers Ltd.



Above—cutaway view shows spray lubrication of wide-faced gear by set of 3 Farval Spray Valves mounted on a special panel which also carries 3 Dualine valves and a reversing valve. At left is the automatic air-operated barrel pump which supplies lubricant to the Farval Spray Valve System. Spray valves may be operated manually also.

News of the MACHINERY INDUSTRIES

By Thomas Mac New

New Government Contracts with Machine Tool Builders Will Provide for Immediate Production of Defense Items in Case of a War

Trigger Contract

According to word received from Washington, machine tool builders won't have to guess what their jobs would be in case of an emergency. The Government plans to start signing contracts soon, authorizing them to start production of defense items immediately in case of a new war.

These new "trigger contracts" will go to each machine tool builder. They will become effective immediately under certain emergency conditions or they can be triggered by notification by the Government.

Contracts will specify types, sizes and quantities of the machine tools a builder would produce in an emergency. It is anticipated that such contracts will save more than a year in starting machine tool production, and this will eliminate the bottleneck which retarded production in World War II and Korea.

Provisions of the contract permit a tool builder to borrow up to 30 per cent of the value of its emergency contract. The Government will not buy the tools produced under the agreements but will guarantee that the builder will suffer no loss under a rapid production speed-up to meet emergency requirements.

Some legal and technical problems between the Government and industry have to be smoothed out before the contracts will go in the mail.

The program is being sponsored by the ODM, while BDSA will determine what tools will be ordered. GSA will negotiate the contracts.

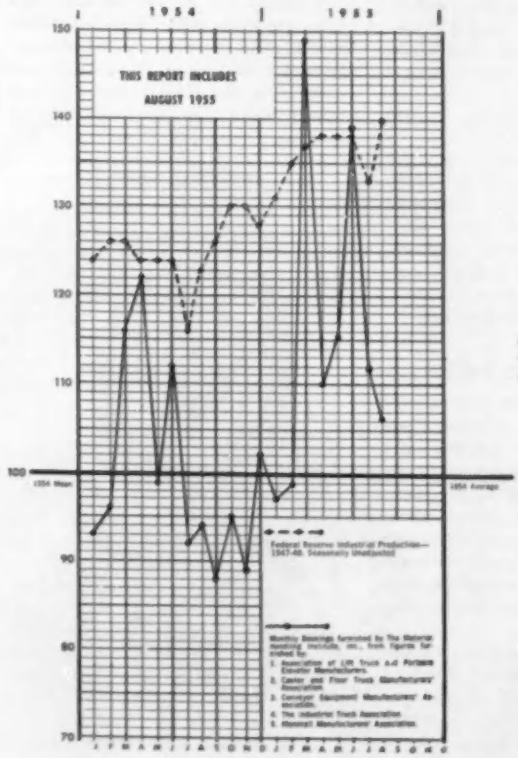
Materials Handling Sales Stable

Although the Material Handling Institute monthly booking index for August shows that materials handling manufacturers sales are slightly lower than preceding months, indications are that there is a continuing stability in that industry, which represents additional investment by companies' capital goods. Actually, the August bookings are 6.2 per cent higher than in August of 1954. According to MHI, the industry is optimistic about fourth-quarter sales, which promise to exceed those of 1953, the peak year reached by the industry.

A Good Year in '56

With machine tool sales expected to be continually on the increase far into 1956 and with the Material Handling Institute's optimistic outlook, the capital goods manufacturers should have an excellent forthcoming year. It is anticipated, in consumer trade circles, that there will be a general increase in trade during the first half of 1956, and this will be dampened somewhat in the second half. However, with the great number of mechanical changes, either in design or production, anticipated in the automobile industry for the 1957 models, everyone is looking forward to another big upswing in sales. Already, machine tool companies are scurrying, getting orders for new machines for 1957 production. Automobile manufacturers are talking in terms of more millions of cars. This requires a great amount of production equipment and perhaps even new plants. It appears as though everyone is placing optimistic forecasting in the future on an increased population with the desire for an even better standard of living which can be provided by our technological advancements in production. Industry no longer thinks primarily of a car for every American family. The trend now is two cars in every garage along with two TV sets, two baths, and other items we once considered luxuries.

MONTHLY BOOKINGS INDEX REPORTED BY THE MATERIAL HANDLING INSTITUTE, INC.

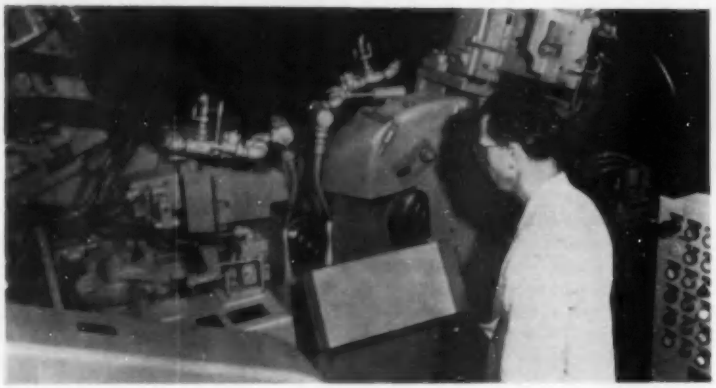


Monthly sales index of materials handling equipment.

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 93

Grinder Adapts to Multi-Diameter Work



Norton CMS-1 plunge grinder

PRINCIPAL advantage of a special purpose grinder which can be adapted to a wide range of cylindrical grinding operations, is its ability to plunge grind multiple diameters simultaneously on workpieces which, because of their shape, do not lend themselves to grinding on conventional multi-wheel machines.

Type CMS-1 grinder has unitized wheel slides which are positioned during manufacture for the requirements of a specific job. The wheel slides may be opposed or placed in line. Provision is made for slight angular or lateral adjustment of position for set-up purposes. The slides are self contained with respect to motion and truing but operate in unison during production. Centrally located one-lever control of the automatic grinding cycle and automatic termination of the cycle under electrically timed control, simplify operation. Auxiliary independent control of the wheel slides is provided for setting up.

Each wheel slide mounts one or more 30 in. diam grinding wheels. Chucking arrangements on a single work head, or equipment for holding the work on centers, can be supplied.

Two-rate automatic feed are said to provide optimum conditions for rapid stock removal, workpiece accuracy, and finish. Convenient wheel feed hand wheels with click-count indexing mechanisms permit feed adjustments in increments of 0.0001 in. without visual attention. Individual push-button operated jogging control of wheel slide movement is provided. The increments of jogging control are adjustable.

Automatic wheel truing is by wheel guard type devices, operating consistently at predetermined speed and feed. Compensation of wheel slide setting for the amount of wheel diameter reduction after truing occurs automatically. *Norton Co.*

Circle 35 on postcard for more data

Broaches Drum Splines

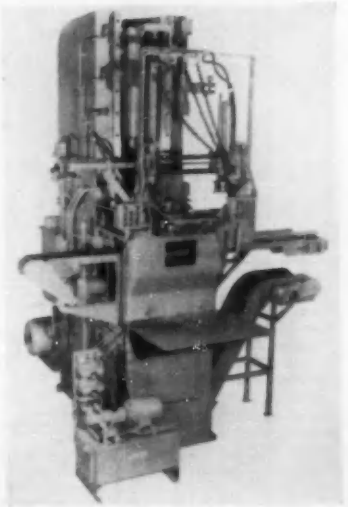
WITH a 30 ton, 60 in. stroke pull-down broaching machine, an automotive concern automatically broaches ten internal splines in an automotive brake drum in one pass. Designed for conveyor line automation, the machine automatically picks up parts coming in from a conveyor line, transfers them to broaching position and after broaching, ejects them back on to the line.

A hydraulically operated loading mechanism with an internal chucking device picks up the part off the conveyor line, and transfers it across to the sliding work-holding fixture. The collet type fixture automatically clamps the part and moves it into broaching position. The broach is pulled down through the part, broaching one-in. wide splines. At the end of the broaching stroke the slide moves out, automatically ejecting the part back on to the belt conveyor. The broach returns to starting position. During the broaching and return stroke the loading unit moves across on guide rails, picks up another part from the conveyor line and returns ready to reload the work fixture. The machine runs continuously on automatic cycle as long as parts are coming in from the conveyor line.

A separate oil tank is provided for the hydraulically operated fixture. The machine has an automatic chip conveyor unit for disposal of chips. A full follow-up retriever mechanism follows the broach through the stroke.

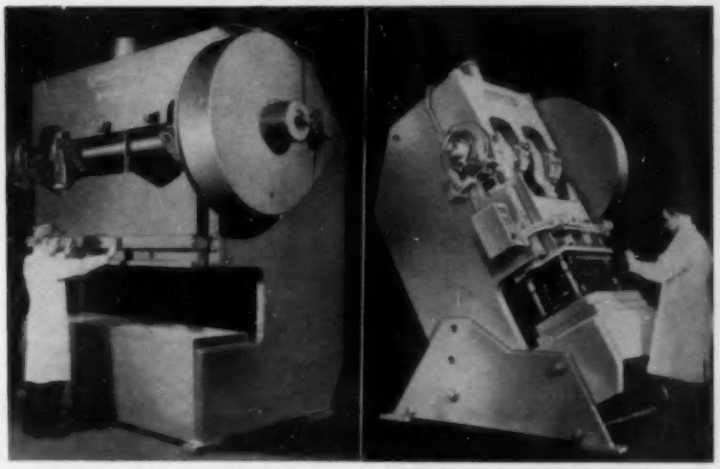
Tooling includes precision type broach pullers with multiple springs and alignment pilots, a hardened and ground arbor, which holds ten broach assemblies, and HSS sectional surface broach assemblies approximately 48 in. long. *American Broach and Machine Co.*

Circle 36 on postcard for more data



American spline broach

Gap Frame Presses



Improved Niagara upright and OBI presses

BUILT in two types, redesigned upright (series B) and open back inclinable (series BI) presses are suitable for a variety of work involving long, progressive dies; multi-station dies, automatic feeds and drawing operations.

Standard capacities, at 1/16-in. above bottom of stroke, are: series B, 45-200 tons; series BI 60-200 tons.

A wide, all-welded steel, box type slide, fully contained within the gibbing, rigidly supports the punches without overhanging flanges. Precision V flat gibbing is brought down closer to the point of application than is possible on flanged slide single crank presses. The rigid, integrally built, all-welded steel, stress-relieved frame resists deflection. An adjustable air counterbalance provides smooth press action. *Niagara Machine & Tool Works.*

Circle 37 on postcard for more data

Digital Meter

A NEW digital voltmeter has been put into production. Known as the type 33-110 SADIC digital voltmeter, its sensitivity is such that 10 millivolts provides full-scale digital output (999). Controls permit selection of any voltage in either of two ranges (10 to 25 and 20 to 50 mv) for full-scale readout. Digital output appears on an illuminated panel for visual readings, and is also available through contact closures representing three decimal digits. Output may be used for operation of automatic typewriters, card punches, and tape punches. Designed for bench-top use, the instrument requires no external power supply other than 115-volt, 60-c.

Input signals to the 33-110 must be quasi-static in nature—that is, they must remain constant long enough for the SADIC to attain balance. Strain gages, pressure pickups, load cells, position-measuring potentiometers, thermocouples, analog computers, and mass spectrometers are a few of the devices which may provide this type of signal. *Consolidated Engineering Corp.*

Circle 38 on postcard for more data

Carbides

TWO new steel cutting carbide grades called CA-606 and CA-609 were developed to give greater edge wear, without loss of shock resistance. The grade 609 is designed for medium, heavy machining where cuts are in excess of 1/16 in. and where the application requires more resistance to wear. The grade 606 has a high resistance to edge wear as well as greater resistance to heat, and is especially useful where machining tolerances must be held. These grades are also made with the new anti-cratering ingredient called Crystalloy, which uses titanium metal in place of titanium oxide to gain greater impact strength and get greater resistance. The new grades are available at regular prices in all standard tips and tools and can be made into any special blanks of any shape or size required. *Carmet Div., Allegheny Ludlum Steel Corp.*

Circle 39 on postcard for more data

Process Loader

AUTO-LOADER is a completely automatic parts transfer mechanism which can be adapted to automatic metal finishing mechanisms operating with an intermittent motion. Originally designed for automatic electroplating machinery, the loader also finds application in anodizing, phosphate coating, etching, electropolishing, oxide coating, painting, cleaning, etc. Size and weight of loaded racks no longer need to be limited by the worker's strength. This loader will accommodate a monorail conveyor system which operates on different planes.

All transfer mechanism is mounted on a reciprocating carriage, moving on rollers in a channel track. Cam

Wagner Auto-Loader

followers attached to the lifting arms duplicate the eccentric contour of the side plates to raise and lower the lifting arms into the loading and unloading positions. The cycle is controlled by the limit switches of the automatic processing machinery, actuated by an hydraulic cylinder, or an electric drive, to move in unison with the transfer cycle. Processed parts are unloaded from the automatic onto the monorail conveyor as unprocessed parts are loaded from the monorail onto the automatic. *Wagner Brothers, Inc.*

Circle 40 on postcard for more data

Wheels Checked for Runout

Wheels being checked on model 144 B-59 Federal electronic gage

UPPER and lower bead seats of automotive wheels are checked for radial and lateral runout on a conveyorized automatic machine. Good wheels within 0.045 in. TIR radial and 0.063 in. TIR lateral runout tolerances pass on to the valve hole punching operation, while rejects are dropped out. Two gages take alternate wheels for a total of 900 per hour. Wheel handling is by hydraulic plungers and pistons. The fixtures clamp by bolt holes at 1000 lb per hole and rotate the wheel. Contacts move in automatically and send impulses to a four-station classifier. *Federal Products Corp.*

Circle 41 on postcard for more data

Tank Rheostat

A CARBON pile tank rheostat for electro-plating is designed to provide precise current control. The new Universal Tank Rheostat consists of a rectangular carbon-plate rheostat, an adjustable nickel-chromium resistor, a reversing switch, a voltmeter and an ammeter. The design also permits the selection of the proper tank rheostat without specifying voltage drop. Ordinarily, this is not possible with standard knife- or rotary-type rheostats. The new unit provides all tank voltages for a specified line voltage up to 12 v, and amperage ranging from 30 to 250. An adjustable resistor located at the top of the case permits basic adjustments to be made on the unit after installation. Fine current adjustments are made by the carbon pile component. Since the basic adjustments are made with the resistor, the carbon pile operates in the range of its maximum effectiveness.

Available is four sizes, the smallest unit is rated at 30 or 60 amp, with plating line voltages up to 12 v. The largest is rated at 125 or 250 amp over the same voltage range. All units are mounted in heavy steel cases that are open at top and bottom for ventilation. The carbon pile component is composed of rectangular carbon plates that are formed into a single pile and housed in a one-piece steel box. *Hanson-Van Winkle-Manning Co.*

Circle 42 on postcard for more data

Colors Castings

AN eight-door stationary fixture finishing machine designed primarily for coloring of aluminum castings has been announced. The new machine has a door on each flat of a single compartment cylinder. Fixture pads are attached to the octagon side walls of the compartment just inside the door opening.

Fixtures are in the form of grids, which fit attached pads. After a fixture is placed inside the cylinder, it is held in position during the processing operation by the pads and by pressure of the closed door pushing it firmly into the contoured pad. It is not necessary to remove processing media or solution when removing work load from the compartment.

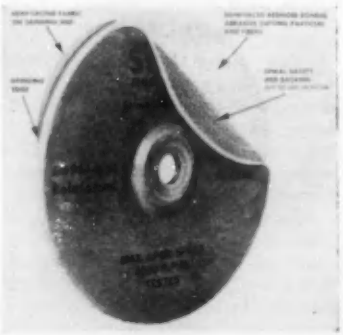
Processing compartments vary in size up to 48 in. long and 42 in. in diameter. The 32-in.-long size, used for coloring aluminum castings with steel balls, uses a 7½-hp drive equipped with automatic reversing electric controls. *Roto-Finish Co.*

Circle 43 on postcard for more data

Grinder Wheels

A SPECIAL safety web backing of spiral wound rayon auto tire cord gives extra strength to high speed abrasive wheels for Simex Red Wheels are a lightweight, rigid type reinforced resinoid bonded abrasive wheel for use on portable disk type and right angle type grinders. They are made in depressed center or raised hub shape in 7 and 9 in. diameters by 3/16 and ¼ in. thicknesses. Application is for rough, tough production grinding especially for grinding welds, and for all types of stainless steel.

Wheels are made from a wheel mix consisting of abrasive cutting particles and synthetic resin bonding agents, reinforced with alpha cellulose fibers criss-crossed and knitted together throughout the wheel mass. In addition to the extra safety web backing on the top side the under side is

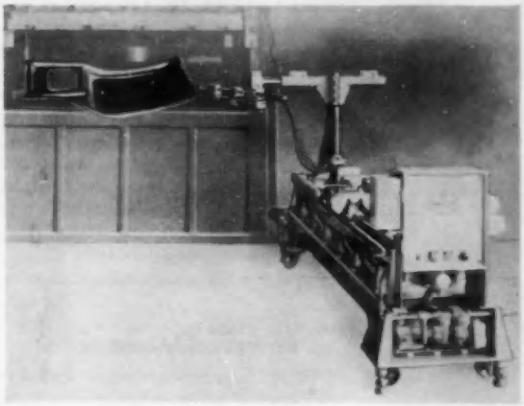


With the Simex wheel for weld grinding the operator grinds with the leading edge of the wheel at about a 30 deg angle, actually cutting away the excess metal.

further strengthened with a layer of reinforcing fabric. There is a knurled or file-type pattern on the grinding or cutting side of the wheels to increase their cutting action. *Simonds Abrasive Co.*

Circle 44 on postcard for more data

Press Hand is Easily Moved



Portable press hand for flexibility

A PRESS hand recently added to a line of automatic handling equipment pulls parts from the die press fully automatically and at a rate of up to 30 spm. Its mobility permits it to be moved from one press to another as conditions require. Operated by compressed air, the unit is controlled by two switches. In operation, the hand travels in to pull the part from the press, then travels back, holding the part under pressure while the entire arm support moves backward from the press on a sliding track. When the arm support reaches the end of the stroke, the hand releases the part and the support moves toward the press again to repeat the process. The hand will be available in three sizes, with 24, 36 and 48-in. strokes. *Hamilton Automation, Inc.*

Circle 45 on postcard for more data

Five-Speed Control

FIVE-STEP push-button units are now being offered for electrically operated equipment. The control is standard equipment on P&H overhead cranes and electric hoists. The variable feature of this control provides five separate control steps in each button with suitable relay or contactor panels. It is possible to hold any one of the five speeds in either accelerating or decelerating the motor. The units can be used with either a-c or d-c circuits and can be mounted in a totally enclosed housing. The outgoing terminals are the only visible parts. *Harnischfeger Corp.*

Circle 47 on postcard for more data

Checks Fuel Used

THE PM fuel burette module and control unit, type I, for engine testing is claimed to operate at 0.5 per cent accuracy at normal system pressures. Design of the stainless steel burette is said to assure upward flow of fuel to the engine, free of air pockets. It is Heliarc welded for a smooth inner surface free of scale.

The system detects a moving fuel/electrolyte interface between two points in a metal burette tube. The fuel valve is an air-operated solenoid unit. The 600-ml size will deliver nominal volumes of 75, 150, 300 or 600 ml of fuel; a 100-ml size also is available. Flow rate for both is up to 1200 ml per minute, for gasolines, kerosenes, Diesel fuels, etc *Performance Measurements Co.*

Circle 48 on postcard for more data

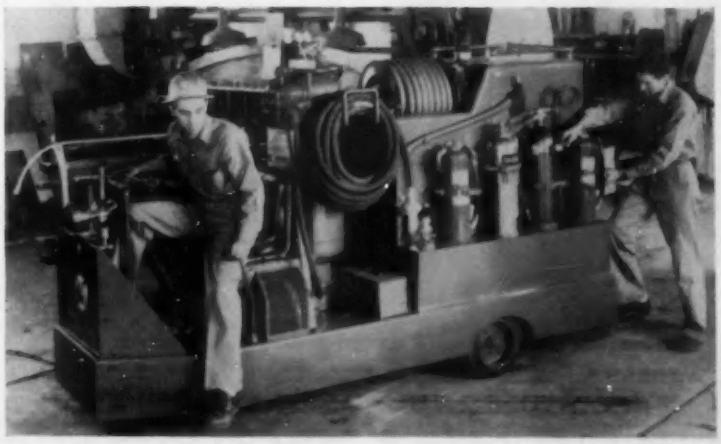
Plant Fire Truck Line

DESIGNED to carry a wide assortment of fire fighting equipment, fire trucks being manufactured by St. Clair Industries of Detroit are available in six basic models. The KB 8 model features a 300-lb dry chemical unit and a 150 gal water fog system. Other units utilizing dry chemical-carbon dioxide combinations, water fog-carbon dioxide combinations or solely water are available. These units are offered on either a three-wheeled 42-in. wide chassis, or a four-wheeled 48-in. wide chassis with more road clearance and a larger engine for indoor-outdoor use. They are built on a Kalamazoo chassis.

Accessories available on the units include ladders, utility bar, light, hose, portable fire extinguishers and extra nozzles, all mounted with panic-proof, quick release brackets to make their removal by one man simple and fast, even in darkness. An accessory cabinet on the truck provides adequate storage room for fire blankets, boots, air masks, coats, first aid kits, etc. In addition, a flashing red light can be mounted on top of the cabinet.

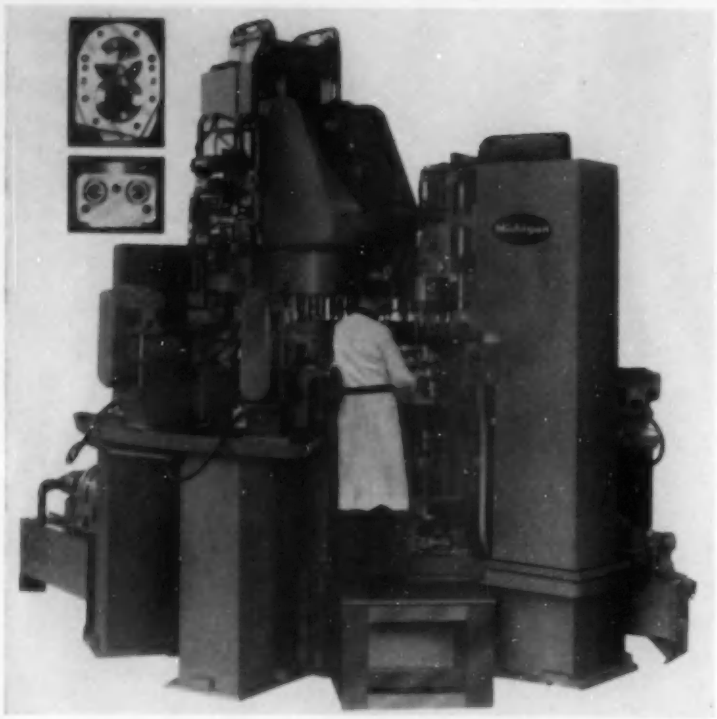
The dry chemical unit comes equipped with 100 ft of hose and a Dualstream nozzle. The pump of the fog system is driven through a power take-off by the 14.6-hp Wisconsin engine which powers the truck. This makes available 300 psi for good fog making and delivers 16 gpm. *Ansul Chemical Co.*

Circle 46 on postcard for more data



Ansul fire truck, model KB8, for industrial plants

Special from Standard Parts



This six-way, 11-station, two-position machine performs 8520 operations per hour on farm implement pump bodies—drilling, chamfering, reaming, end milling, trepanning, rough and finish boring and tapping—on several interchangeable parts. (Michigan Drill Head Co.)

Circle 49 on postcard for more data

Wire Stripper

For aircraft and other manufacturers using quantities of wire leads, a semi-automatic wire stripper for bench mounting is now ready for marketing. Weighing about 90 lb, the DBS No. 2 wire stripper is said to be a rugged, compact unit. It measures 19 in. wide, 21½ in. long, and 11 in. high, and is powered by a ¼-hp motor. The unit operates mechanically and stripping is accomplished by means of a cam and pin clutch. Gears are totally enclosed and run in oil. To strip any length of wire, one end is laid in a slot provided in the front guard. This trips a Micro-Switch which then starts the stripping cycle. While stripping takes place, the switch is automatically moved away from the wire, allowing the stripped installation to fall free. The stripping length is easily adjusted by a control knob on the side of the machine. A scale graduated from ⅛ inch to ⅝ inch indicates the stripping length desired. The wire is tightly clamped while stripping takes place. Wire gauge from No. 10 to No. 20 can be handled, and wire leads stripped at speeds up to 3000 per hour. *Artos Engineering Co.*

Circle 50 on postcard for more data

Part Winding Motors

Part winding motors together with one of the magnetic increment starters made for the purpose reduce starting shock to machines, minimize line disturbances and meet power company requirements for limited current inrush. Locked rotor current is reduced to approximately 65 per cent of normal, and starting torque on the first step is about 50 per cent of full-voltage starting torque. The firm is building the motors in all standard enclosures, from five to 200 hp.

For two-step starting, half of the motor winding is energized across the line as the first magnetic contactor closes. At the end of a timed cycle, the second contactor closes to bring in the second half of the winding in parallel with the first. In typical three-step starting, the motor starts with reduced voltage on the first winding, accelerates as full voltage is added to the first winding and then, in the third step, reaches rated speed as the second winding is brought in at full voltage. Even less current draw than is needed with these standard steps can be provided. *Howell Electric Motors Co.*

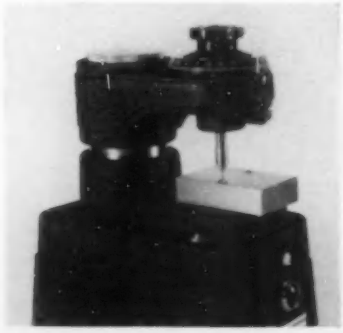
Circle 51 on postcard for more data

Powered Micrometer

Direct measurements accurate to 0.00005 in. or better, independent of any human variable in sensing contact or setting the dial, are said to be obtained with the model H motor-driven electronically controlled precision micrometer. A screw-thread measuring instrument, it shows actual dimensions of any electrically conductive part directly on a three in. dial with widely spaced dial divisions for each 0.0001 in. After placing work on anvil, the operator presses a small button. A built-in motor brings the micrometer to the precise point of contact with work at a high rate of speed. At the instant a setting is completed a green light glows under the index window.

The electronic circuit controlling the motor drive senses instant of physicial contact between micrometer tip and work within 0.000005 in. When the button is released the motor automatically backs micrometer away from work about 0.001 in. A repeat reading can be obtained instantly by again pressing the button. *J. W. Dice Co.*

Circle 52 on postcard for more data



Electric micrometer has range of one in., throat depth of two in., adaptability to special fixtures.

Conveyors for Deburring Machines

AUTOMATION is now available on BME-24 two-station external machines and BMI-15 single station internal machines for gear deburring and chamfering. On both these standard model universal machines the rate of deburring and chamfering five teeth per second is maintained. It is possible to change from one gear to another within a reasonable range by making relatively minor changes in machine tooling and automation fixture tooling while keeping the basic automation intact.

With the machine selector switch in the "automatic" position, the loading disk on an external machine picks up one gear at a time from loading storage and permits it to slide forward into the loading station. At the completion of one cycle the part moves along to the first work station where a spring-loaded elevator places the gear on the work spindle. Five indexes of the pilot gear are allowed to make certain that the part is properly engaged with the workpiece.

After the gear is completely deburred and chamfered, the elevator returns the part to the endless chain conveyor where it moves to the turnover station and is rolled over 180 deg for deburring and chamfering of the second side.

If either loading storage ahead of the machine is empty or unload storage from the machine is full and cannot accept additional gears, remotely located switches ahead of and following the machine or opened stopping the cycle. Also if the timing relay times out indicating a prolonged cycle, the machine is stopped and red signal light is energized.

Automated two-station Burr-Masters provide automatic lubrication of all mechanical parts once each cycle of machine operation.

Automatic deburring and chamfering of internal gears and splines is handled on the model BMI-15 Burr-Master shown, that can be furnished for gears ranging from 2 to 20 in. P.D. Movement of the loading cylinder rotates a loading disk and permits one part to pass through at a time into the transfer line. The internal gear to be deburred and chamfered moves into an elevator that locates the part centrally above the work station. At the same time a completed gear is ejected into the exit chute.

As the transfer cylinder returns, the quill moves downward and the workpiece moves into contact with the radial gaging pinion. Since the radical gaging pinion turns in timed relation to the spline driver, this interaction insures that the spline driver mounted on the spindle will enter the internal gear teeth. The quill continues its movement carrying the workpiece down into the work station, starting the chamfering cycle by tripping a limit switch. After the workpiece has made one complete revolution and all gear teeth are deburred and chamfered, the reciprocating form cutter stops in the retracted position and the part is raised from the work station completing the cycle. *Modern Industrial Engineering Co.*

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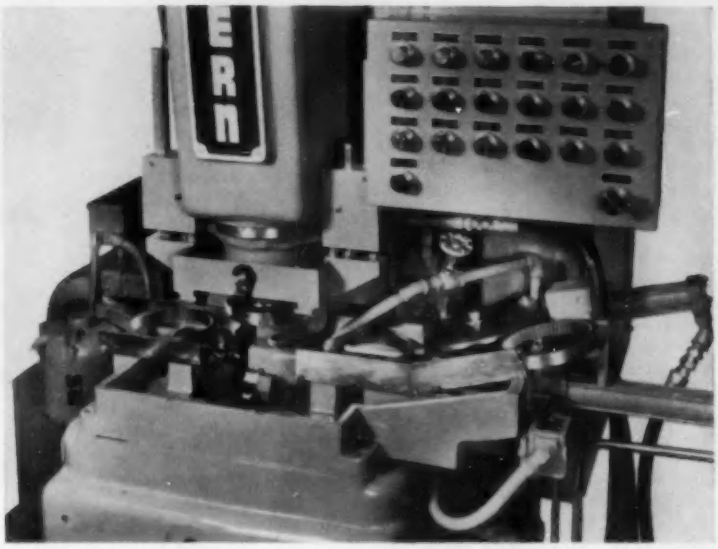


BMI-15 Burr-Master with automatic loading cylinder

Resin Wheel

RESINOID bond B11 used in conjunction with new molding and firing techniques, is said to insure a much more uniform structure than has been possible in resinoid wheels previously. Increased uniformity of structure or spacing of abrasive grains throughout the wheel is claimed to offer more accurate and uniform work, improved surface finish, reduced diamond truing tool costs as well as lower unit grinding costs. Changes in the automatic cycle need not be made to compensate for variations in grinding action. *Norton Co.*

Circle 54 on postcard for more data

Chip Conveyor

A CUSTOM-BUILT self-cleaning all-steel drag flight conveyor has each flight or bucket drag on a steel pan when elevating. When it returns, it moves above the same pan, dropping any of its load of wet steel chips that might have stuck to the flights. In the installation, this eliminated the necessity of floor cleaning. A replacement problem for the belts previously used was solved. The new conveyor, from automatic screw machines to gondola cars, also showed a one-third reduction in the power required. *Michigan Crane & Conveyor Corp.*

Conveyor for wet steel chips

Circle 55 on postcard for more data

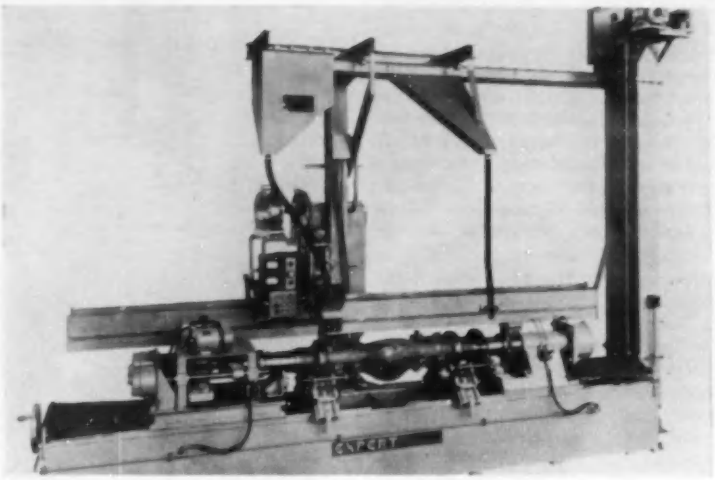
Shielded-Arc Welder for Long Assemblies

CIRCULAR welds on assemblies up to 13 ft long are made on a general purpose, semi-automatic, shielded-arc welding machine recently designed.

The machine has a 19-ft steel bed which supports a variety of fixtures that are moved along the bed to suit assembly length variations. The fixtures have a motor-driven headstock, tailstock with live centers, rest blocks for supporting the parts during loading and roller steady rests that support the parts during welding. Air cylinders control the axial motion of both head and tailstocks.

Conventional submerged arc welding equipment is mounted on ways. A mechanical-type flux recovery unit and preheating units are also provided. To operate the machine, the parts are positioned, the head and tailstock centers are advanced by air cylinder controls. The air cylinder that moves the tailstock center is larger than the one that moves the headstock center. This allows the tailstock center to move to a fixed predetermined location while the headstock center adjusts itself to expansion variations of the assembly during welding.

The welding head is positioned axially to proper location along the assembly to be welded by moving it along the ways manually and clamping. Pushbutton controls for the two motor drives on the head are then operated to bring the welding head to correct vertical and forward location.



Expert submerged-arc general purpose welder to weld flanges on each end of earth-moving equipment axle housings.

With the welding head positioned, the assembly is rotated by a ½-hp motor drive during the preheating and welding operation. During welding, flux is gravity fed to the weld area from a hopper. The welding wire advances automatically while the assembly is being rotated. This welding operation is continued for one or more passes. Excess flux from the welding operation falls onto a mechanical oscillating conveyor under the fixture, moved to one end of the machine where it is screened and returned by screw conveyor to hoppers.

Other welding operations along the assembly are accomplished by repositioning the head and repeating the preheat and weld sequence. *Expert Welding Machine Co.*

Circle 56 on postcard for more data

Varying Pulley

DESIGNED that it can be mounted with the belt take-off close to the motor or in an overhung position away from the motor, a ¼-hp variable speed pulley delivers speed ratios up to 2 to 1. An A section belt is used. Maximum bore is ⅝ in. with keyway. It is offered with oil-impregnated bearings, with optional grease fitting.

Variable speed pulley for limited space applications

The E-1350 pulley is made from fine grained castings, carefully machined for balance and fit. The outer sheave is keyed to the inner shaft with a heavy-duty key and held in position by a special screw. The sliding shaft, which is part of the inner sheave, is precision ground for close fit. The pulley can be used with the maker's 135 variable speed base, the 200 tilting base or any other sliding base or shifting mechanism desired. Overall dimensions are 3 5/16 in. length by 3 in. diam. Weight is 26 oz. *Lovejoy Flexible Coupling Co.*

Circle 57 on postcard for more data

Aluminum Putty

DEVCON F, which consists of approximately 80 per cent aluminum and 20 per cent plastic, is now being used for filling very large and small holes in aluminum and steel castings, to cover holes which have been drilled incorrectly, and to build up worn sections. The machined surface has an appearance almost identical to aluminum or polished steel. A large mass can be applied to a vertical surface and will not run or sag. No special skill is required, according to the supplier. The material is claimed to have excellent adherence to aluminum and steel, and also to bronze, brass, and cast iron. It will bond to a flat surface and can be machined to a feather edge. It is not necessary to undercut the metal or treat it in any special way. No volatile solvents or thinners are used; therefore the putty will not shrink or pull away during hardening. *Chemical Development Corp.*

Circle 58 on postcard for more data

Mobile Lubricator

POWER lubrication for use anywhere in industrial plants, is provided by the Prime Lubricator. Powered by a six-hp, air cooled engine, the unit has a single stage air compressor, said to provide ample air pressure to handle all the requirements of the lubricating equipment. It is equipped with three heavy duty hose reels with 25 ft of hose, and three 120-lb drums of industrial lubricant. *Aro Equipment Corp.*

Circle 59 on postcard for more data

Aro lubricating truck has 33-in. turning radius

Die Handler

THE Model 1014, largest die handler in the maker's line, handles dies or molds measuring 36 by 75 in. weighing up to 6000 lb. Its top platen is of cast meehanite and is raised and lowered with heavy precision lead screws, driven by a two-hp electric motor mounted in the base. Under power, the top platen rises at the rate of 12 in. per minute. Fine adjustments in position can be made with an auxiliary hand crank. *Hansford Manufacturing Corp.*

Circle 60 on postcard for more data

Alignment Gage for Differential Carrier

THE relationship gage is designed to check production differential carriers against a master part. The gage duplicates the location and clamping of the workpiece in either a progress-through or transfer type machine.

Using the master workholding fixture and working master carrier, the gage itself is checked for accuracy. Using the master fixture with a production carrier will show any misalignment in the carrier or discrepancies in locating and clamping surfaces. The carrier is loaded and unloaded with the help of a sprocket and chain arrangement. This system can check the machine tool station by station for spindle height and location.

The gage is loaded at station 1, with the fixture and carrier. At station 2 the fixture and carrier are slid into the load position. Gaging takes place at station 3, where the fixture and carrier are loaded manually. The fixture is held by a cam actuated equalizing clamp after two locating pins have entered the fixture. *LaSalle Tool, Inc.*

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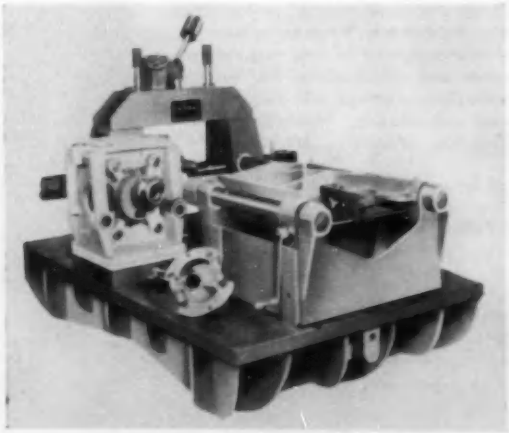


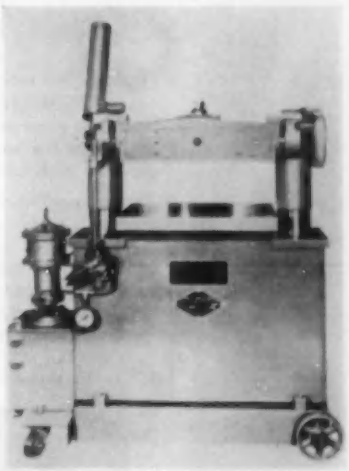
Differential carrier is loaded over the lower pinion bore indicator. Then front pinion bore housing shown is advanced with rack-and-pinion, two cross bore indicators are advanced.

Die Tryout Press

DIE tryout presses of 50 or 75 ton capacity, operated either pneumatically or hydraulically, now are available. The head can be released and rotated to any point up to 240 deg. The base houses two hydraulic cylinders. The 50-ton press occupies 28 by 56 in. of floor space. Overall height with stroke down is 64 in. The 75-ton press occupies 30 by 60 in. of floor space; overall height with stroke down, 66 in.

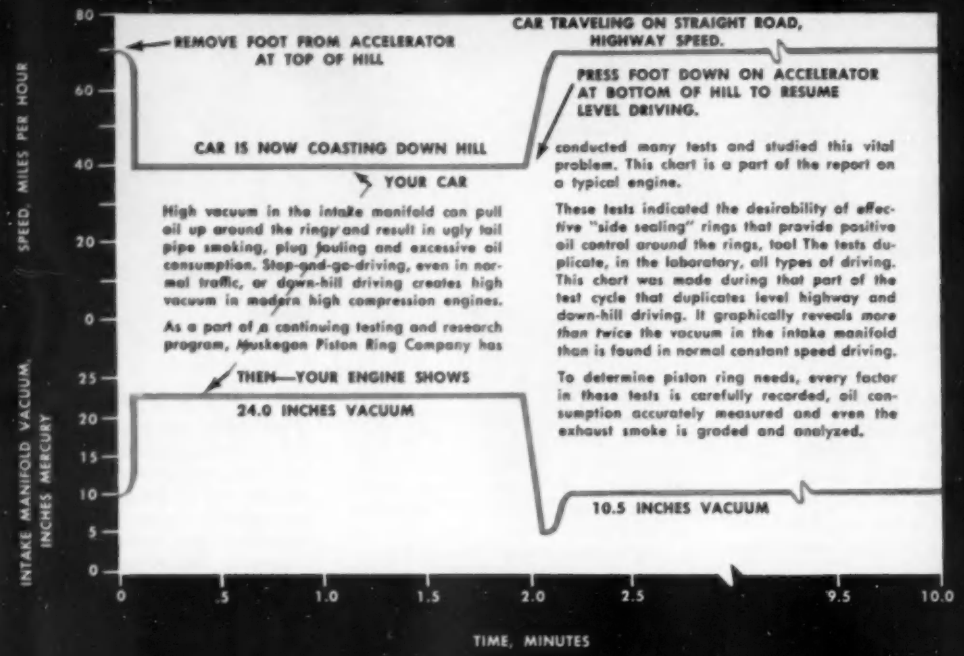
Tonnage of the airdraulically operated press is based upon 80 psi air pressure. Both models are mobile. Both die members can be barbered, sheared, fitted and finished without removal from press. *Alpha Press and Machine, Inc.*

Circle 62 on postcard for more data



Alpha die tryout press

High Vacuum Creates Oil Control Problems...



YOUR CAR conducted many tests and studied this vital problem. This chart is a part of the report on a typical engine.

High vacuum in the intake manifold can pull oil up around the rings and result in ugly tail pipe smoking, plug fouling and excessive oil consumption. Stop-and-go-driving, even in normal traffic, or down-hill driving creates high vacuum in modern high compression engines.

As a part of a continuing testing and research program, Muskegon Piston Ring Company has

These tests indicated the desirability of effective "side sealing" rings that provide positive oil control around the rings, too! The tests duplicate, in the laboratory, all types of driving. This chart was made during that part of the test cycle that duplicates level highway and down-hill driving. It graphically reveals *more than twice* the vacuum in the intake manifold than is found in normal constant speed driving.

To determine piston ring needs, every factor in these tests is carefully recorded, oil consumption accurately measured and even the exhaust smoke is graded and analyzed.

Muskegon's New "Side-Sealing" Piston Rings Solve 'Em!

Using these extensive laboratory tests as an engineering basis, Muskegon has designed three new "Unitized" oil control rings that cover the problems created by high intake manifold vacuum.

These new "side sealing" rings incorporate a wedge action that effectively seals the ring grooves to prevent oil flow around the rings. They also incorporate the features that have made Muskegon rings synonomous with performance and long life. They're chrome plated and lapped to give faster break-in and reduced wear. They're "Unitized" to provide faster handling and error-proof installation. A special adhesive is used to bind the ring components together... the adhesive dissolves during run-in, leaving the pieces free to form a perfect seal.

These new "side sealing" piston rings are available now. Write today for complete details. Give us your ring requirements and specifications and we will furnish quotations and samples for your examination. *Muskegon Piston Ring Co., Muskegon, Michigan.*

Patent Number 2,140,710

MUSKEGON Piston Rings

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FREE LITERATURE

Screw Machine 1

The unit-construction principle of the Detroit Screwmatic 750 single spindle automatic screw machine is covered in a six-page folder. *Gear Grinding Machine Co.*

Electric Steel 2

How electric furnace alloy, stainless and carbon steels are produced is illustrated in a colorful brochure. It shows facilities, services and personnel of *Rotary Electric Steel Co.*

Enclosed Switches 3

A complete line of industrial enclosed switches is covered in 28-page catalog 83, which describes in detail the wide variety of enclosed switches which are designed for use on either a-c or d-c applications. *Micro Switch, Div. of Minneapolis-Honeywell Regulator Co.*

Electric Motors 4

Design and construction features of its full line of motors from ⅛ to 500 hp are included in a new catalog. *Howell Electric Motors Co.*

Cylinders 5

Twenty-eight page bulletin 101-A describes a complete line of air and hydraulic cylinders. Includes engineering data, capacity chart, dimensional drawings and specifications covering all standard sizes, mounts and mounting brackets. *Ortman-Miller Machine Co.*

Finishing Castings 6

Bulletin PP-125 on finishing of aluminum and zinc base die castings describes recommendations made by the laboratory for many die cast items ranging from automotive door handles to camera range finders. They include type and size of buff or wheel, minimum number of operations required, wheel speed, necessary abrasives or compositions, etc. *Frederic B. Stevens, Inc.*

Flexible Shaft 7

Circular 247 on flexible shafting shows more than 20 application photographs on production machines and mobile equipment. *Elliott Manufacturing Co.*

Socket Tools 8

Twenty-one different Gulmite serrated tools, which fit the various makes of drivers, wrenches and drive adapters, are shown in a new catalog. *Bergander Mfg. Co.*

Fixture Method 9

Explained in data sheets is a new expanding method for holding parts while machining, gaging and checking, with engineering drawings and applications. The method is being used for internal and external grinding, precision turning, facing and boring, gear shaping, gear shaving, checking arbors and fixtures. *Chas. J. Martin & Sons.*

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Roller Conveyor 10

A facts book to be used for laying out a roller conveyor system contains a general description of the uses and applications of the various components. There is included a method of analyzing loads as to weight distributions and grades, as well as charts and descriptions of motor drives, powered sections for inclines and declines, horizontal and vertical curves and belt tightening units. *Lamson Corp.*

Stainless Data 11

Additional technical information on AM 350, a chromium-nickel-molybdenum stainless steel hardenable by subzero cooling or double aging, which bridges the gap between the 300 and 400 series, is included in a 10-page booklet now being offered by *Allegheny Ludlum Steel Corp.*

Needle Rollers 12

An illustrated engineering catalog on precision needle rollers is complete with charts and formulae. Twelve-page catalog (No. 61) includes data on rollers never before published and is based on precision rollers in automobile and truck transmissions, universal joints, clutches and steering gears. *Kaydon Engineering Corp.*

Specialty Steels 13

A new 32-page, illustrated guide to specialty steels is now available. The booklet defines the distinctive characteristics of a broad range of special purpose steels in terms of end use. *The Carpenter Steel Co.*

USE THIS POSTCARD

Non-Contact Gage 14

The proximity meter, a capacitive type electronic instrument that measures without touching the specimen, is described in a 28-page booklet. The instrument can detect a change in temperature of 0.001 C, or variations of 0.000001 in., pressures of 0.00001 in. of water, etc. *Fielden Instrument Div., Robertshaw-Fulton Controls Co.*

Expanding Wheel 15

Constant diameter grinding wheels are explained in a folder being offered by *Continental Products, Inc.*

Drill Units 16

A 12-page catalog contains photographs, line drawings, descriptions, and specification charts covering two models of automatic cam-driven drill units, including three types of drive arrangements and three possible mounting positions. A special section permits the reader to trace, through numerical reference, the operational action of the unit on drilling and tapping operations, including the movement of mechanical components, and the energizing of electrical circuits. *The Morris Machine Tool Co.*

Furnace Control 17

Bulletin F 5795-2 describes how the Capaciline, a supplementary control device, "anticipates" the fuel needs of controlled heating equipment and enforces straight line control on the process variable. Heat transfer lags are anticipated and effectively compensated for by means of a simple electrical network and relay circuit synchronized with the measuring system and controlling circuits without affecting accuracy of the temperature reading at the control point. *Barber-Colman Co., Wheelco Instruments Div.*

Flexible Hose 18

Flexon bellows and flexible metal hose are featured in 16-page catalog No. 150. Specifications on Rex-Weld flexible metal hose through 14 in. I. D. are shown for the first time. Some typical bellows applications are shown in line form. *Flexonics Corp.*

Molybdenum Data

A compilation of technical and fabricating data on arc-cast molybdenum is presented in a 72-page booklet. It is designed to provide those interested in the high temperature applications of molybdenum with a complete picture of where it stands today and possible uses in the very near future, for example, in turbine blading. Write to *Director of Technical Information, Climax Molybdenum Co., 500 Fifth Ave., New York 36, N. Y.*

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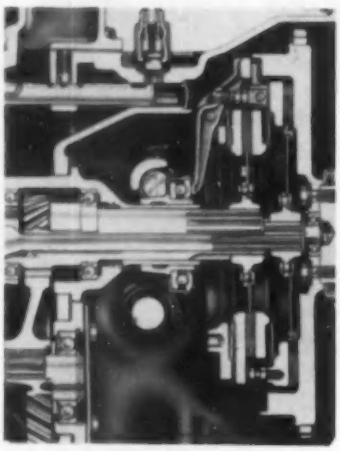
NEW PRODUCTS AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 93

Two-Stage Clutch

A Spicer two-stage clutch originally designed for use on the Ferguson 35 tractor enables the farmer to operate trailing machines continuously re-



gardless of tractor starts and stops. It is operated by a single foot pedal, and controls power into the tractor drive wheels, and to a live pump and power take-off. The dual function clutch actuates both an 11-in. primary and a 9-in. secondary disk in turn.

Two input shafts are used. This is accomplished by splining the secondary tubular hydraulic pump and power take-off input shaft. Input shaft of the transmission passes through the hollow take-off shaft. Driving surface for the secondary disk is provided by a special flywheel ring. Thus by pushing the clutch pedal part way down, through the light pressure range, the primary disk is disengaged, controlling the forward motion of the tractor. While travel is stopped, the operator can shift gears, but he has live power take-off and pump which continues to operate take-off machines, or to raise implements on the hydraulic lift.

When the clutch pedal is pushed or depressed through its full range of travel, it disengages the secondary disk stopping the power take-off and the hydraulic pump. A stop of simple design enables the operator to depress the clutch through its first stage but prevents disengaging the secondary disk and stopping the hydraulic pump and the power take-off. *Dana Corp.*

Circle 20 on postcard for more data

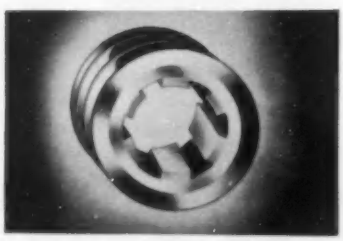
Pressure Valve

An absolute pressure regulator valve handles flows up to 40 cfm. Maintaining constant pressure at inlet temperatures as high as 550 F, this unit can be placed on any jet bleed line to air turbine power packs, compartment pressurization and cooling systems, or fuel tank pressurization and relief systems. *Century Controls Corp.*

Circle 21 on postcard for more data

Broached Socket

A socket set screw with the socket extending the full length of the screw is now available in a range of sizes from No. 4 wire size to one-in. diameter in suitable lengths, and in either



the hex or multiple spline socket. The through-broached socket is symmetrical, and the screw can thus be wrenched from either end. No grinding or modifications are necessary for use in power screwdrivers. Holding power of the new screw is equal to that of conventional socket set screws. They can be used either as set screws or as locking rings. *Bristol Co.*

Circle 22 on postcard for more data

Aircraft Motor

A general purpose, open-type aircraft motor is designed to provide a lightweight drive for blowers, pumps, actuators, etc. Weighing only 3.5 lb

the motor delivers ¼ hp continuously at 7200 rpm. Motor is designed for three-phase, 400-c, 200-v operation.

Designated Type A, the motor functions at altitudes up to 40,000 ft with starting torque of 4.0 in.-lb. Self-ventilated, the motor operates in sea level ambient temperatures from 55C to 71C. Mounting bracket and take-off shaft are standardized in accordance with military specifications. The motors are available in a variety of types including internally-geared, totally-enclosed, and explosionproof motors. *U. S. Electrical Motors Inc.*

Circle 23 on postcard for more data

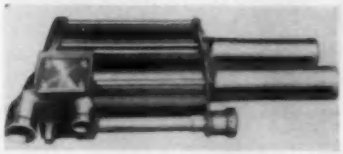
Coated Fabrics

Four additions to an upholstery line include two new patterns and a new finish in Elastic Naugahyde and a new pattern in Breathable Naugahyde. The two new patterns of elastic are Polynesian, introduced in ten colors, and Pebble in six colors. Both are offered in 54 in. width and 30 oz weight. The new finish is Glazed Antique, a smooth, high gloss finish of Elastic Naugahyde, of entirely new construction. It comes in 20 colors and two weights—27 and 40 oz. It is 54 in. wide. The new Breathable pattern, called Pylon, is available in 12 colors. *U. S. Rubber Co.*

Circle 24 on postcard for more data

Hydraulic Reservoirs

Lightweight hydraulically pressurized reservoirs for aircraft oil-hydraulic systems hold constant pressure during all flight conditions and at



high temperatures. Fluid is maintained at pump inlet pressure through a differential piston device operated by pump discharge oil at system pressure. Constant inlet pressure for the hydraulic pump is provided over all flight conditions independent of attitude, altitude, engine speed and temperature, because the reservoir design results in an airless system. One version is contoured to fit engine curvature. Others are available in a wide range of sizes. They may be used with either MIL-O-5606 or MIL-L-7808 fluid over a temperature range of −65 F to +350 F in systems having pump discharge (operating) pressures up to 4000 psi. The aluminum tank has a filter located integrally in the return passage, that is a full-flow, all metallic, low pressure-drop unit easily disassembled for cleaning. Low pressure sliding seals prevent exterior leakage. High pressure seals are used internally and work against low pressure oil instead of air. A system air bleed valve is provided for convenience in filling the system. Visual or remote indication of system fluid level is optional. These reservoirs require no control valves; reservoir pressure is maintained at a predetermined value by a pressure compensated pump or other regulating means. Any system using this device needs neither compressed air nor an air pressure regulator. *Vickers, Inc.*

Circle 25 on postcard for more data

Safety Hose

Oxygen hose that carries radio communication wire on the outside is designed to eliminate possible danger of sparks from the wire igniting the oxygen. It also minimizes the danger of the pilot becoming entangled in the wire in an emergency bailout.

The pilot can unplug the radio wire quickly, or the wire plugs will pull loose easily when the pilot ejects himself from the cockpit. The wire, insulated in plastic, runs down the "screw" outside the new oxygen hose. This also makes it easier for maintenance men to see and repair breaks in the wire. *Dayton Rubber Co.*

Circle 26 on postcard for more data

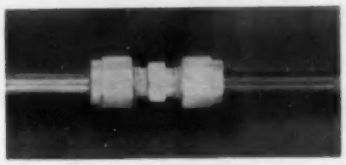
Air Hose

Compressor discharge hose No. 2800 for use on truck and bus air-brake systems is available in sizes from ¼ through one in. The new hose is constructed with a silicone inner tube and features a stainless steel outer braid. It is designed to operate at 125 psi. *Aeroquip Corp.*

Circle 27 on postcard for more data

Tube Insulator

Swagelok galvanic tube insulators of Du Pont Zytel polyamide resin offer a method of eliminating galvanic action which results from joining dis-



similar metals. With their use, brass, aluminum, copper and steel may now be joined. The insulators are made in a complete line of shapes and in 1/16 to one in. tube and pipe sizes. *Crawford Fitting Co.*

Circle 28 on postcard for more data

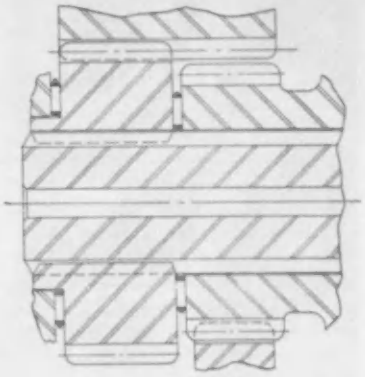
Truck Lamp

A 12-volt truck headlamp is intended for use on certain heavy trucks, usually Diesel-powered, whose vibration could damage filaments and cause premature burnouts of existing headlamps recommended for lighter trucks. Headlamp No. 5440, has three anti-shock construction features: A small shock-absorbing ceramic block through which the four lead-in wires are threaded to keep them separated and in exact position, and to prevent filaments from touching under conditions of excessive vibration; a separate rod, rather than lead-in wires, to hold the fog shield. Pre-formed lead-in wires, to eliminate any spring action which might tear filaments loose. In addition, filaments are designed to have a longer burning life. *General Electric Co.*

Circle 29 on postcard for more data

Needle for Thrust

NTA series needle bearings have been designed exclusively for thrust applications. They may be used alone, or in combination with regular needle



bearings for both thrust and radial loads. Roller diameter is 0.078 in. for four sizes: ½-in. bore by 15/16-in. O. D., ¾ by 1¼ in., 1 by 19/16 in., and 1¼ by 1 15/16 in. The illustration shows an application in an automatic transmission, where hardened and ground parts permit elimination of a bearing race. Retainers are two mating halves of very accurate stampings, joined by spinning. Needles are high carbon chrome steel, hardened to Rc 60 minimum and lapped to a tolerance of 0.0002 in. on the diameter. Races, if used, can be low cost stampings case-hardened and tumble-burnished. High speed applications may require ground and lapped races. *Torrington Co.*

Circle 30 on postcard for more data

Sight Gage

Oil level sight glasses for helicopter transmissions that are shatter-proof, resistant to corrosion and aging and retain their clarity are standard equipment now in all Sikorsky helicopters.

The fluorine plastic proved the only material with the combined properties of resistance to severe corrosion, extreme temperatures and shock and vibration, which could stay transparent indefinitely.

Chemically inert to the oils, acids and sludges found in the transmission systems, the Kel-F fluorine plastic does not swell, shrink or lose its rigidity over a temperature range of −65 F to as high as 300 F. *Nichols Engineering, Inc.*

Circle 31 on postcard for more data

Integral Stiffened Spars Machined on Sculpturing Mill

By E. O. LOWE, General Foreman, Dept. 407, El Segundo Div., Douglas Aircraft Co., Inc.

THE A4D Skyhawk, the midget bomber, is a working example of weight saving techniques at the El Segundo Division, Douglas Aircraft Co., Inc.

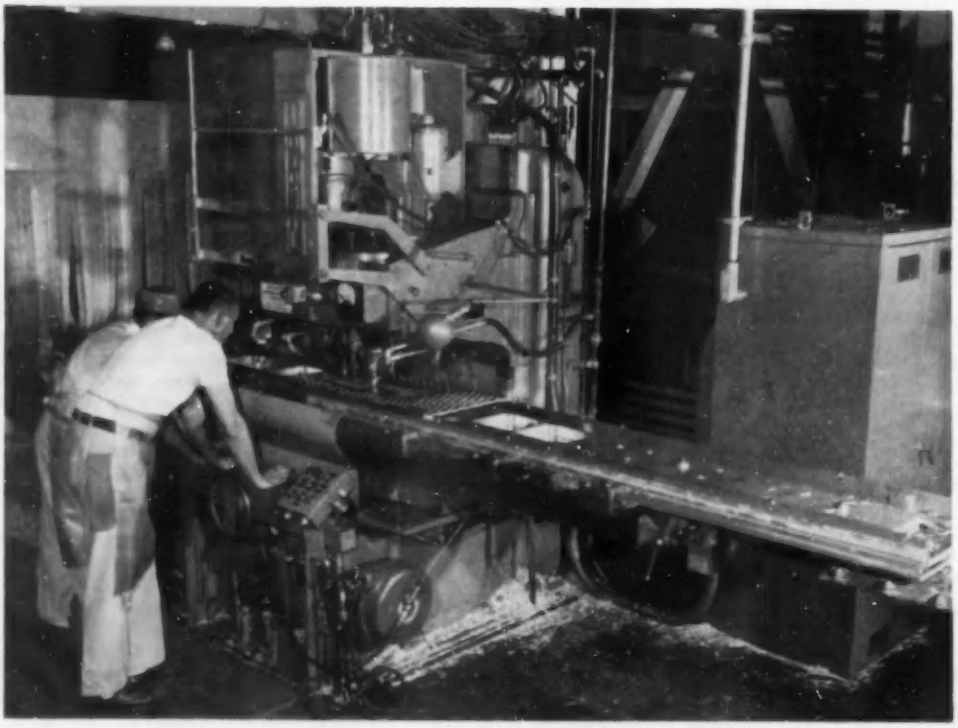
The spars of the wartime Douglas SBD Dauntless were typical of fabricated spars. Those spars had spar caps, top and bottom, laced together with detailed parts that were attached by rivets and bolts. Those made-up structures required 265 hours fabrication time per spar and employed a machine tool investment of over $300,000.

The integral stiffened spar of today's A4D Skyhawk requires but 24 hours of milling with a tool investment of $130,000 and the spars are proportionately stronger.

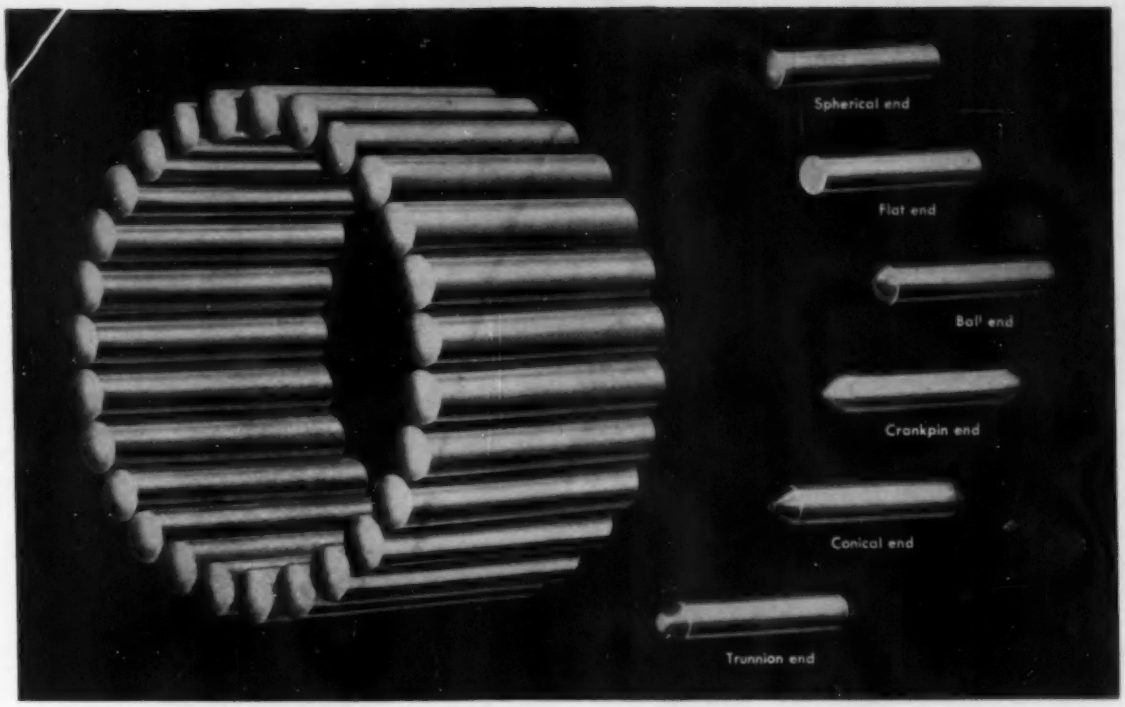
These spars begin as blanks of two-inch stock and they vary in width and length up to 27 ft long and 14 in. wide. They are milled on Onsrud Invomils modified to Douglas specifications. The bed of the Invomil traverses under the router-like cutting tool so that one setup of the blank suffices for the complete machining for the part. Low cost segmented steel templates are indexed to the blank and contouring is controlled from a control board directly in front of the cutter. As each section of the part is completed the steel template in use is quickly removed and the next template in sequence is then indexed to the part.

This high-speed sculpturing mill is accuate to extremely close tolerances. It required but 400 sq ft of manufacturing floor space and is simply made with no special foundation or coolant system and no elaborate electronic controls for its operation.

(*Turn to page* 180, *please*)



Milling an A4D spar on the specially tooled Onsrud Invomil



TORRINGTON Needle Rollers

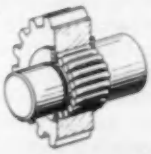
for the ultimate in load capacity at low cost

High radial capacity in minimum space stems from full complement of small-diameter rollers. Load zone contains maximum number of contact lines.

Fine finish contributes to efficient anti-friction performance. Needle Rollers are usually polished to 4-6 rms, but finishes as fine as 1-3 are available on special order.

High carbon chrome steel is carefully hardened, ground and lapped to make each Needle Roller a precision part for long-life performance.

Close tolerances on Needle Rollers are assured by stringent quality controls. Standard OD tolerance is .0002" but rollers can be supplied with OD tolerance of .00005." Tolerance on length dimension depends on end formation.



Mounted without races between hardened shaft and hardened housing (RC-60 recommended), Needle Rollers allow largest possible shaft diameters.

Torrington Needle Rollers provide the lowest cost, highest capacity anti-friction bearings obtainable. They are manufactured in a complete line to meet SAE and AFBMA specifications. Available in the inexpensive spherical end type or in other end shapes, they provide maximum retainment and fillet clearances or greater lip retainment. Needle Roller standards for material, heat treat, tolerance and finish are the highest in the industry.

Good operating results with Needle Rollers require careful design of mating parts furnished by the user. The Engineering Department of The Torrington Company, with broad experience in applications of Needle Rollers, will be glad to give you technical advice on your needs.

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Torrington, Conn. · South Bend 21, Ind.

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TORRINGTON *NEEDLE* BEARINGS

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The BUSINESS PULSE

Industrial and Commercial Transactions Have Remained Unaffected by the Heart Attack of President Eisenhower. Rise in Gross National Product Was Based Chiefly on Increased Customer Buying and Higher Capital Investment.

This Survey Is Prepared Exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Company of New York.

Uncertainty Dispelled

Much of the uncertainty created by the President's illness has been dispelled in recent weeks, thanks to the pronounced strength of general business.

Not only has the brisk tempo of the summer period carried over in fullest measure but in addition there appears to have been a further acceleration of activity because of seasonal movements. The significant news of recent weeks, in other words, is that industrial and commercial transactions, as distinguished from security-market operations, seem to have remained essentially unaffected by Mr. Eisenhower's heart attack.

We cannot be sure, of course, that business won't be influenced over the longer term, but for the present there is a large measure of gratification in the fact that the economy held to its course with such steadiness during the initial test. It is significant that at this writing the stock market itself appears to have settled down to more or less normal trading activity.

These favorable developments certainly enhance the prospect for a sustained high volume of economic activity over the remainder of this year. The factor of momentum alone seems a sufficient guarantee in itself of prosperous conditions for the next several months, but the expectation of continued good business is by no means dependent on this factor alone. In addition, the economy will be stimulated by the rapidly increasing volume of automobile production—which appears to be heading for an all-time November-December record—and by Christmas trade activity. Many retail trade analysts anticipate pre-holiday sales of all merchandise from 5 to 10 per cent larger than in 1954.

GNP Running at High Rate

Gross national product may not register as big a gain in real terms for the final quarter of this year as it did in the preceding three quarters, inasmuch as the economy appears to be operating close to the "full-employment" ceiling. Some increase does seem probable, however, and if this expectation is realized, the economy will undoubtedly be close to the $400-billion level when 1956 begins. This is indicated by the fact that GNP was running at an annual rate of $392 billion in the third quarter, according to preliminary estimates of the President's Council of Economic Advisers.

The release of the Council's third-quarter GNP estimates undoubtedly made a contribution in itself to business confidence last month, for not only did the figures confirm the continued presence of great momentum in business activity, but they pointed up a number of elements of qualitative strength in the economy.

First of all, the estimated annual rate of $392 billion represented a $7.2-billion rise over the rate in the second quarter of the year. The surprising and encouraging thing about this increase is that it approximately matched the rate of gain in the three preceding quarters, whereas there had been rather general feeling among analysts, before the estimate was released, that the rate of advance had slowed. What this comes to is that the economy arrived at the threshold of the final quarter of the year with a larger measure of forward thrust than had been anticipated. This certainly has favorable short-term implications.

Increased Consumer Buying

The nature of the rise in GNP from the second to the third quarter was perhaps even more gratifying than its magnitude. Analysis of the movement of the individual subdivisions of GNP discloses that the rise was founded in the main on increased consumer buying, aided by higher capital investment. In other words, the increase derived neither from an accelerated rate of inventory accumulation nor from rising expenditures by the Federal Government. Actually, the annual rate of inventory accumulation dropped from $4.3 billion in the second quarter to $3 billion in the third, while Federal outlay registered only a very slight increase. This reduction in the rate of inventory investment, incidentally, adds strong support to the view that the rate of accumulation so far this year has not been excessive.

Consumer spending in the third quarter was higher

(*Turn to page* 119, *please*)

SCHWITZER
CORPORATION
INDIANAPOLIS, INDIANA
for 37 years
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PUMPS
SUPERCHARGERS
TURBOCHARGERS
DAMPERS
SEALS
SCHWITZER
CORPORATION

AIR BRIEFS

By RALPH H. McCLARREN

New Rocket Engine Plant Dedicated

A new $4 million rocket engine development and production facility, one of the most modern and complete in the United States, was officially dedicated on October 7. Constructed under a joint program between Reaction Motors, Inc. and the U. S. Navy the newly-completed plant includes over 200,000 sq ft of working area, consolidates RMI's administrative offices, research, engineering and manufacturing operations previously divided between Rockaway and Lake Denmark, N. J. and expands the company's facilities in its extensive test areas.

It is located on a 50-acre site in the lake region of northern New Jersey, less than 40 miles west of New York City. Built with future requirements in mind, the new plant is equipped with a well-rounded inventory of modern equipment and testing of rocket engines and their component parts. These rocket facilities are arranged for maximum versatility to meet changing development and production requirements in a young but rapidly—growing industry. RMI, a pioneer in the rocket propulsion field was established 14 years ago for the purpose of research, development and production of rocket engines and related items, its products have been responsible for establishing a number of "firsts" in the supersonic propulsion of piloted aircraft and missiles. RMI engines have been used to power the 1944 Navy "Gorgon" and the 1945 "Lark" guided missiles. Also the Bell XS-1 and Douglas "Skyrocket," supersonic aircraft. Of late their rockets are used in Helicopters to produce extra power take-off with heavy loads.

Air Conditioned Helicopter

An air conditioned helicopter is the latest development in the rapid progress of this type of aircraft.

The Garrett Corporation's AiResearch Manufacturing Division has announced installation of its air cycle refrigeration system, the same type used to cool the cabin interiors of jet fighter aircraft, in the new Sikorsky S-59 jet-powered helicopter.

Utilizing a tiny two-pound turbine unit, small enough to be held in the palm of the hand, the system has a cooling capacity equal to that of 35 household refrigerators. It is particularly suitable to the helicopter because of its light weight and compactness and was found readily adaptable to the requirements of Sikorsky's jet model, holder of the world's speed and altitude records since 1954.

Need for cooling a helicopter interior is particularly apparent when its large expanse of windows becomes exposed to hot sunshine in prolonged ground operations or during flight.

Jet Planes for the Airlines

An order by Pan American World Airways for $269,000,000 of jet airplanes has been announced. Pan Am's order has been split between Boeing Airplane Co. of Seattle, Washington and the Douglas Aircraft Co. of Santa Monica, California. Boeing has already flown a test prototype model of its model 707 jet airliner. Douglas has its DC-8 on the designing board and in the mock-up stage.

Eastern Airlines also recently announced an order for 100 Lockheed Electra's, a turbo-prop transport.

These orders for jet aircraft will place the United States Airlines in the lead for fast long-range air travel. Last year the airlines were viewing with interest jet airliner development in Europe yet hesitated to place definite orders because of the promising developments of U. S. manufacturers. Use of the new jet transports will make possible six hour nonstop flights from New York to Paris and transcontinental U. S. flights in four or five hours.

Already in use in this country and in Canada are the turbo-prop Viscounts flown by Capital Airlines and Trans Canada Airlines. It is a new and comfortable experience to fly in the Viscount.

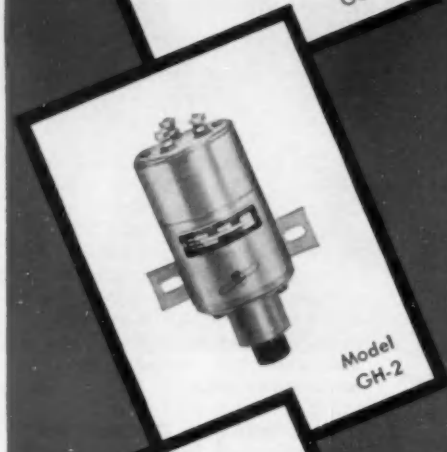
Nuclear Engineering and Science Congress

The first cooperative congress of its kind relating to atomic energy and nuclear engineering will be held in Cleveland, Ohio—December 12 to 16, 1955. The Congress is being sponsored by 26 cooperating organizations and will include papers presented from industry, government agencies and the universities. Many of the papers being declassified expressly for the meetings.

(*Turn to page* 108, *please*)

SPEED SENSITIVE SWITCHES

1 Synchro-Start overspeed governors are basically speed sensitive switches designed to open or close a set of contacts when operating speed increases to undesirable proportions. Governors can be supplied to trip at any speed between 500 and 10,000 R.P.M. The underspeed governors are identical in appearance but are built to open or close contacts at a point below their normal running speed. These governors can be furnished to trip at any speed between 400 and 5,000 R.P.M.



2 The two element speed sensitive switch is designed to open or close two independent sets of contacts at two different speeds, both can be independently adjusted. It is particularly adaptable to engine and turbine control systems. Any trip speeds between 500 and 10,000 R.P.M. can be furnished. Automatic transmissions usually require a device for changing torque multiplication at certain specified speeds. The two element unit is ideally suited for such an application.

3 The three element speed sensitive switch performs all functions of the two element switch, but in addition has the exclusive feature of opening or closing three independent sets of contacts, each of which can be independently adjusted. This unit is particularly adaptable to the more elaborate engine and turbine control systems. Almost any combination of trip speeds between 1,200 and 10,000 R.P.M. can be furnished in a standard unit.

For complete information on all units request Bulletin No. 5045.

Synchro-Start Products Inc.

8151 N. RIDGEWAY AVE.
SKOKIE, ILLINOIS

Industry News

(*Continued from page 43*)

Skilled Workers Pushing Efforts For "Recognition"

Skilled workers are slowly drifting away from the UAW-CIO. Dissatisfied with contracts negotiated with car companies last summer, they are beginning to join other labor groups. The movement could give car makers new headaches in future negotiations. Instead of dealing with one major union, as the UAW, car companies would have to fight several on individual demands.

More than 500 UAW skilled workers in Michigan alone already have switched over to craft unions, and the newly formed Society of Skilled Trades is posing another threat to the UAW. Basis for the new movement is the skilled workers' drive for more recognition and a wider wage spread between skilled and production employes, although such rate differentials have broadened over the past few years. At present, for example, there is an average difference in pay of nearly 70 cents an hour between tool maker and the assembler, compared with only a 30-cent differential some 15 years ago.

The International Die Sinkers Conference recently took 55 die and special-tool men from the UAW at the Oldsmobile forge plant in Lansing, while more than 450 have moved over to the Pattern Makers Association from UAW locals at two other GM divisions and at Ford.

"Objective" Safety Body Proposed By AMC President

George Romney, president of American Motors Corp., suggests that an Automotive Safety Research Institute be established to step up work on safety by all car companies on a cooperative basis. Romney feels that safety is being over-publicized by individual companies and placed in a competitive area. An organization such as he proposes, Romney says, would conduct objective tests on all makes of cars, with test results becoming available to all automobile companies.

The Institute would have a twofold purpose: It would furnish data on accident statistics showing what happens to passengers and vehicles during collisions, and provide information on controlled tests of available vehicle design and possible future design. It would also serve to educate the public in the proper use of safety devices, without excessive claims by individual companies.

ONE-PIECE TAILGATE FOR BRITISH STATION WAGON

Humber Hawk station wagon features a one-piece tailgate hinged at the bottom. The rear seat folds flush with the floor to provide a seven-ft cargo platform. Chassis is similar to that of the Humber Hawk sedan, but the station wagon has strengthened frame and rear suspension.

Ford To Step Up Output In Louisville and Elsewhere

Despite skepticism in some quarters about automobile production and sales for 1956, car companies continue to raise their sights even higher. Ford Div., which has boosted production currently to a 2½ million annual output rate in the U. S., plans to further step up assembly operations, and has been placing many plants on two-shift operations.

At a preview of the 1956 Thunderbird car, L. W. Smead, general sales manager of the division, said Ford is able to fill only about 85 per cent of dealer orders at present, necessitating further increases in output. As for the Thunderbird, he said that orders equal all the production scheduled for the remainder of the year.

Although it agreed that the comparison was not a valid one, the division noted that Thunderbird sales totalling about 16,000 were 35 per cent higher than total sales for the 18 makes of sports cars sold in the U. S. Ford prefers to refer to the Thunderbird as a "personal" car rather than a "sports" car.

In addition to boosting car output recently at Dearborn, Mahwah, N. J., and Louisville, the Division announced last month that truck operations at Louisville will be put on a two-shift schedule starting in January. An additional 500 employes will be hired there, bringing the Louisville payroll to $2 million annually.

Kelsey-Hayes Plans Merger With Ohio Engineering Firm

Merger activity among automotive suppliers is popping up again. The latest involves Kelsey-Hayes Wheel Co., Detroit, and Steel Products Engineering Co., Springfield, Ohio, but no plans have yet been finalized. As in many other mergers, diversification of products would be the resultant advantage. Kelsey-Hayes supplies the automobile industry with wheels, while the Ohio firm is a major manufacturer of aircraft parts, ordnance equipment, and precision machines and machine tools.

Book Tells How Communities Solved Their Traffic Problems

How highway and traffic problems have been solved by some communities is explained in a new book to be published by Ford Motor Co. Based on extensive research by Ford and leading highway and traffic safety organizations, the book, titled "Freedom of the American Road," contains actual case histories of what many local communities and states have accomplished in highway and traffic improvement. The 120-page volume is divided into three sections, titled "The Highway," "The Traffic" and "The Driver." It will be available about Feb. 1.

Packard-Clipper Looks For "Good" 4th Quarter

Packard-Clipper Div. is looking forward to a good fourth quarter after showing a profit for the third quarter. The division did not reveal any figures, with the exception of projected production for this year, which it expects will be around 80,000 units, an increase of 100 per cent over 1954. A 50 per cent output increase is planned for 1956, indicating about 120,000 units.

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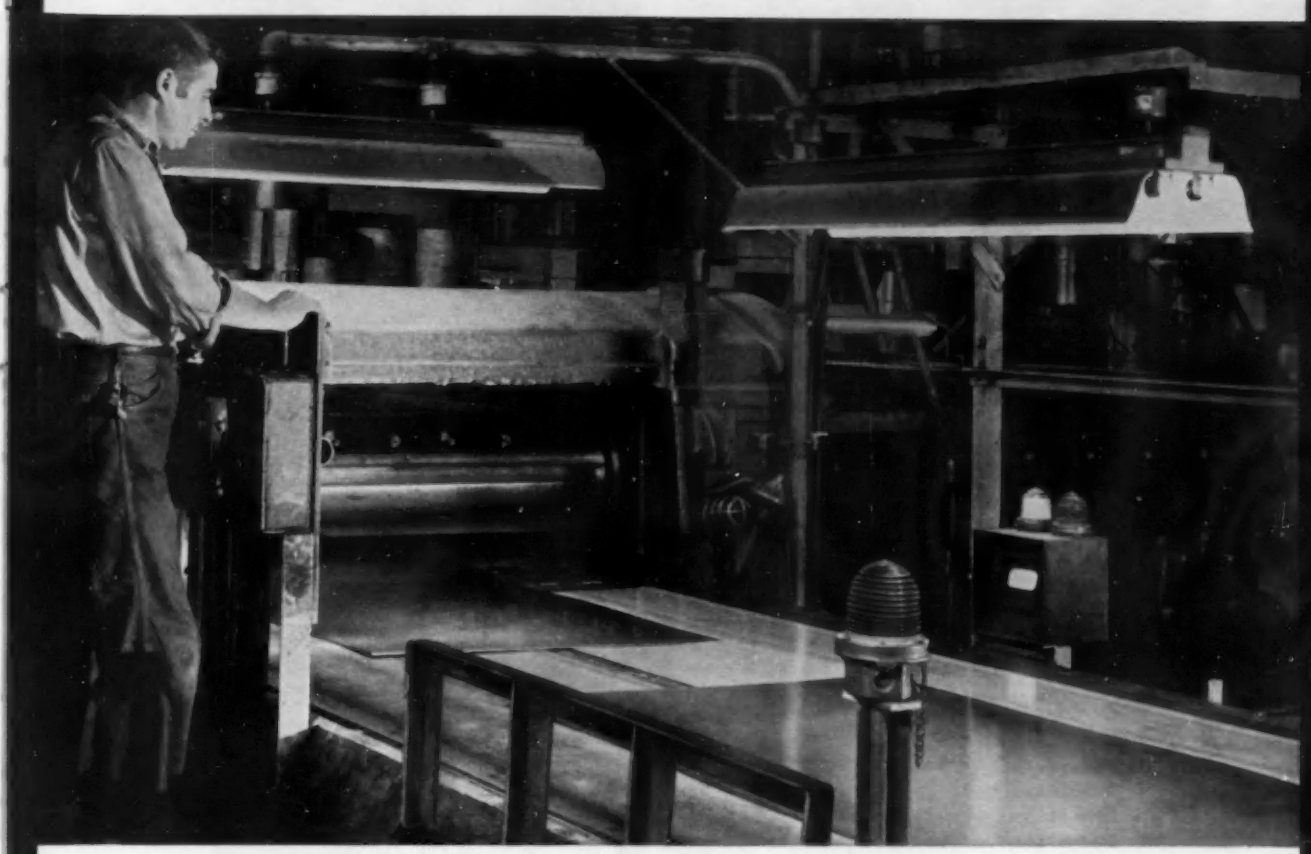

How Great Lakes Steel *X-rays* quality

Above: Stacking sheets after the X-ray check. *Below:* With dozens of tests passed and uniformity assured, the flat-rolled steel is O.K.'d for wrapping and delivery.

Why do sheets from Great Lakes Steel consistently meet customers' specifications? The X-ray machine is one of the answers. Here an indicator (shown above) signals the thickness of steel sheets as they pass on a conveyor belt. Any sheet failing to meet the established standard is immediately ejected.

Throughout the Great Lakes mills, modern machines and experienced men work together to maintain the consistent quality of our flat-rolled products. Our service includes close contact with customers by Great Lakes representatives, men who are concerned not only with steel production but also with the performance of our steel in the plants of customers.

The next time you have a problem in steel, give us a call. You will find that both quality and service are *consistent* at Great Lakes Steel.

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Forged Aluminum Equalizer Beam Saves 60 Lb of Unsprung Weight

THE continual quest for weight savings by the trucking industry made another advance with the use of a forged aluminum equalizer beam in the Hendrickson tandem axle suspension.

The conversion of this part from a steel forging to one of aluminum allows a weight savings of 120 lb of unsprung weight in a complete Hendrickson heavy duty tandem.

The equalizer beam assures equal division of the truck load under all conditions. This is accomplished by causing all four wheels to be in contact with the road surface even if one wheel rides over a bump or falls into a hole. The beam thereby reduces damaging effect of road shock on chassis and load.

An increase in section depth was made on the aluminum part, but it was possible to produce a 50 per cent weight savings with the light metal. The finish-machined aluminum beam weighs 60 lb. Alcoa 2014-T6 is used for the forging.

Aluminum beam forging installed in the Hendrickson tandem. This photo was taken from under a truck. The aluminum beam saddle, which is made as a permanent mold casting, can be seen above the beam forging. Photo courtesy Aluminum Co. of America.

PUBLIC SALE OF FORD STOCK

(*Continued from page* 63)

and their interests will become shares of new voting "B" Stock.

There are now outstanding 172,645 shares of voting "B" Stock, all owned by members of the Ford family and their interests. Each of these shares will be exchanged for 21 shares of the new voting "B" Stock, an exchange ratio differing from the 15-for-1 ratio applicable to the shares of "A" Stock. Holders of the old "B" shares will thus acquire a 1.74 per cent additional equity in the Company. This increased equity reflects, in addition to the other terms of the plan, the relinquishment of the exclusive right to vote in the affairs of management. In transferring 60 per cent of the voting rights to the new Common Stock, holders of old "B" shares accept an immediate drop in their voting right from 100 per cent to 40 per cent for all family interests.

There will, then, be 53,461,470 shares of stock in Ford Motor Company outstanding after the stock reclassification.

The Ford Foundation plans to make a public offering of about 15 per cent of its holdings. While no date has been fixed, it is hoped that this offering can be made shortly after the first of the year. Prior to the offering, a statement as to Ford Motor Company's history, business and operations, earnings, and financial position will be filed with the Securities and Exchange Commission and made public.

Assuming such a sale, Company stock then outstanding would include 14,065,143 voting shares and 39,396,327 non-voting shares. Of these totals:

1. Public investors would own 6,952,293 shares of new voting Common Stock, and Ford Motor Company employes, on the basis of options thus far exercised, would have received on the reclassification 632,100 shares of new voting Common Stock.

The new Common Stock will have one vote per share. The total shares of new Common Stock will hold 60 per cent of the voting power, although they would represent initially only about 14 per cent of the total outstanding stock of the Company. As additional "A" shares are sold in the future and converted to the new Common Stock, these shares will also participate in the 60 per cent voting power which attaches to all this Common Stock in the aggregate.

2. Members of the Ford family and family interests will own 6,480,750 shares of new voting "B" Stock. Whenever any of these shares are

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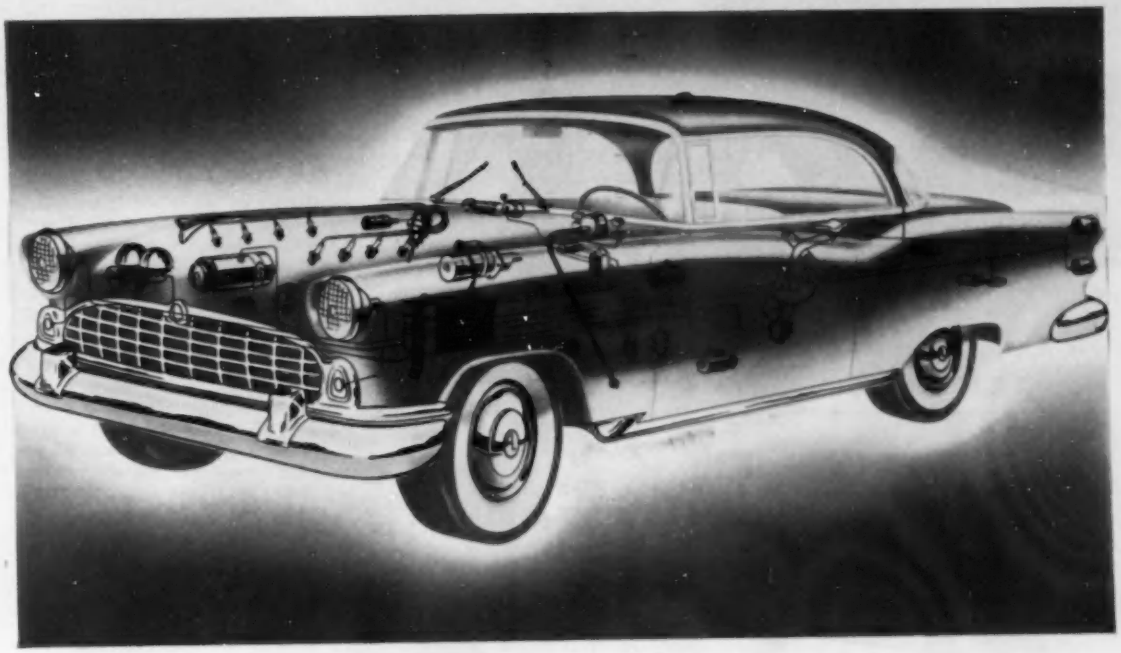

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THE ELECTRIC AUTO-LITE CO., Toledo 1, Ohio

AUTO-LITE *Manufacturers of...*

BATTERIES • BUMPERS & GRILLES • CASTINGS—Gray Iron, Zinc and Aluminum • HEADLIGHT DIMMERS • FUEL PUMPS • GENERATORS HORNS • IGNITION UNITS • INSTRUMENTS & GAUGES • LIGHTING UNITS • METAL FABRICATED ASSEMBLIES • MOTORS—AUTOMOTIVE FRACTIONAL • STARTING MOTORS • SPEEDOMETERS • SPEEDOMETER CABLE • PLASTICS • SEAT AND WINDOW MOVING MECHANISMS SPARK PLUGS • SWITCHES • WINDSHIELD WIPERS • WIRE & CABLE

AIRBRIEFS

(*Continued from page* 102)

The meetings will be coordinated by the Engineers Joint Council, 29 W. 39 St., New York 18, N. Y. Local arrangements are being handled by the Cleveland Engineering Society, 2136 E. 19 Street, Cleveland 15, Ohio, in cooperation with the Cleveland Technical Societies Council.

An exposition entitled "International Atomic Exposition" is being held in conjunction with the meeting and will be sponsored by the American Institute of Chemical Engineers, 22 W. 45 Street, New York 26, N. Y. On exhibit are to be recent developments in industrial application of atomic energy including an operating atomic reactor. Among the exhibitors identified with the aircraft industry are Bendix Aviation Corp., Curtiss-Wright Corp., General Dynamics Corp., The Glenn L. Martin Co., and North American Aviation, Inc.

Vanishing Americana
Whoever first thought of sticking his arm out the car window to let other motorists know what he was about to do certainly had a good idea . . . so good, in fact, that very shortly every driver got into the act—each with his own personal set of signals—each as distinctive and confusing as the next.
Later, all 48 states issued their own standards of hand signalling. But variations by smokers, arm-danglers and a hard core of non-conformists continued to contribute a considerable amount of confusion.
Since 1939, however, hand signals have been on their way out. Hastening their demise was the development of the commanding and decisive flashing-light directional signal. The heart of this system is the Tung-Sol Flasher.
To date, Tung-Sol has made more than 50 million Signal Flashers which have built an amazing record for life-of-the-car dependability. Wherever you plan to use a signal light, make it a commanding light with a Tung-Sol Flasher.
TUNG-SOL ELECTRIC INC., Newark 4, N. J.
Sales Offices: Atlanta, Chicago, Columbus Culver City, Dallas, Denver, Detroit, Newark, Philadelphia, Seattle. Canada: Montreal
TUNG-SOL
AUTO LAMPS • SIGNAL FLASHERS
TUNG-SOL FLASHER P229D

Air Passenger Revenues—Excluding Commutation — Top Railroads in 1954

In a recent issue of *Planes*, official publication of the Aircraft Industries Association of America, Brig. Gen. Milton W. Arnold states that in 1954 the United States scheduled airlines carried a record 35,184,000 revenue passengers and for the second straight year passenger revenues of these airlines and local service carriers topped rail passenger revenues, excluding commutation. Considering common carrier travel of trips of 1500 miles or more, he states, that about 85 per cent of all those who use air, rail and bus means of travel, take the "High Road."

Deliveries of Utility and Executive Aircraft

During August, 1955, six aircraft companies delivered a total of 216 1-10 aircraft valued at $4,383,000. Cessna Aircraft led the list with a delivery of 147 aircraft; Beech was next with a delivered 55 aircraft; Aero Design delivered 5, six passenger Aero Commanders; Mooney delivered 7 of their single place machines and Call Air and Taylorcraft each delivered 1. No shipments were reported by Piper Aircraft Co. because of a strike which has tied-up their production.

Since January, 1955, and including August shipments, the seven companies noted above delivered a total of 3017 aircraft. The highest number of any one type is 714 Cessna Model-180 aircraft.

In the twin engine category Beech lead the field with 84 twin Bonanzas and 63 twin Beechcraft. Aero Design was second with a total of 40 Aero Commanders delivered during the January-August period.

Direct Take-Off Aircraft

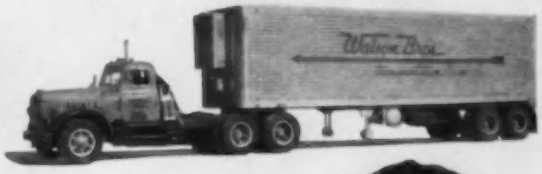
There are several new developments under way. McDonnell and Bell Aircraft companies are flight testing their Convertiplanes built under sponsorship of the Army and the Air Force. These aircraft have rotors for direct take-off and wings to support them in forward flight. McDonnell idles the rotor when flying fast and uses a propeller for forward thrust. Bell tilts the rotor from up to horizontal (90°) to provide for forward thrust.

Bell Aircraft is also flying an experimental direct-lift machine using two turbo-jet engines. The engines

Best Buy on the Market

BENDIX-WESTINGHOUSE AIR BRAKES

Preferred by America's Leading Fleet Operators



MR. ROBERT E. LEE
President, Lee Way Motor Freight, Inc.

From his company's recently constructed million dollar General Office and Terminal Building in Oklahoma City, Oklahoma, Mr. Lee directs a modern system of nearly 1000 units of mobile equipment serving over 700 cities in Oklahoma, Texas, Kansas, Missouri and New Mexico. Through a subsidiary, Sooner Freight Lines, Mr. Lee's company also serves an additional 196 cities in the western half of Oklahoma. Mr. Lee, one of the Southwest's best known transportation executives, states:

"In our 20 years in business

We've bought 2,100 trucks

AND WHEN IT COMES TO AIR BRAKES, WE PREFER

Bendix-Westinghouse!"

THE WORLD'S MOST TRIED AND TRUSTED AIR BRAKES

MR. FAY V. WATSON
President, Watson Bros. Transportation Co., Inc.

From executive offices in Omaha, Nebraska, Mr. Watson heads a company whose vast fleet, in 1954, travelled a distance equivalent to over six times around the world every 24 hours! This mileage was rolled up by 2400 modern highway units operating over 16,000 miles of certified interstate routes stretching west from Chicago and St. Louis to the Pacific Coast, and from St. Paul, Minnesota, in the north to Kansas City in the south. Mr. Watson, a veteran transportation executive states . . .

"During our 28 years in business

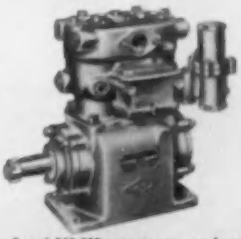
We've bought 5,000 trucks

AND WHEN IT COMES TO AIR BRAKES, WE PREFER

Bendix-Westinghouse!"

THE WORLD'S MOST TRIED AND TRUSTED AIR BRAKES

As designers and producers of trucks for America's highway transportation industry, you naturally try to build into your models all those features which will give your product an edge over competition. When it comes to brakes then, why not equip your trucks with the air brakes America's leading truckers know and prefer—Bendix-Westinghouse! Yes, for 25 years Bendix-Westinghouse Air Brakes have been first choice of truck operators everywhere, consistently outselling all other makes of air brakes combined! Take advantage of this overwhelming preference by offering your customers Bendix-Westinghouse Air Brakes as factory-installed equipment. It's one sure and easy way to add more sales-appeal to your vehicles!

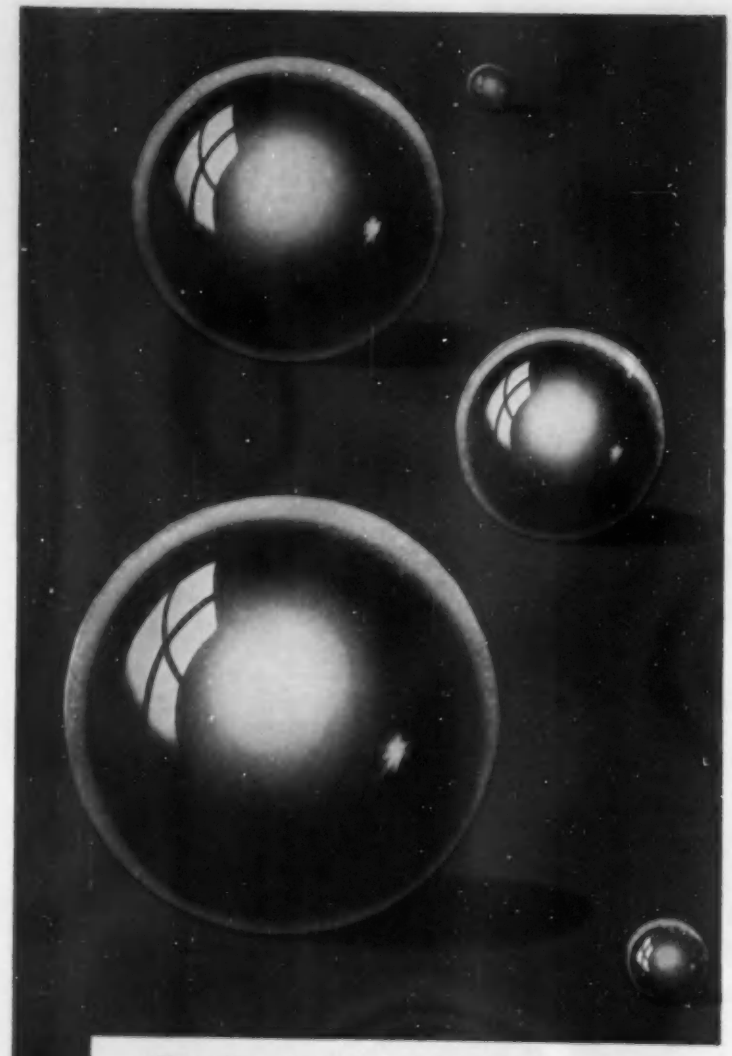


Over 1,500,000 compressors produced over a 25-year span stand behind the TU-FLO 400. Many advanced features guarantee performance no other compressor can equal.

25

Bendix-Westinghouse BENDIX-WESTINGHOUSE AIR BRAKES **AIR BRAKES**

BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY • General offices and factory—Elyria, Ohio. Branches—Berkeley, Calif. and Oklahoma City, Okla.



are located vertically for take-off and their thrust directed downward to provide lift. For forward flight the engines are rotated 90° to provide thrust aft. A small wing supports the craft in horizontal flight. Ryan Aeronautical Company is testing a scale model variety of the "venetian blind" wing type developed by the National Advisory Committee for Aeronautics. It is powered by large diameter propellers which blast the air over a multi slatted wing which deflects the air down over the wing. A combination of thrust from the props and lift from the wings produces a direct lift.

Tests continue in England with the flying "bedstead," and designs are being developed to incorporate the use of jet-engine thrust for vertical take-off of an aircraft.

Although nothing has been heard of late about CONVAIR's and Lockheed's V.T.O.'s it is assumed that their flight tests and evaluation tests are progressing. Until these new types are proven and their safety and reliability assured we'll continue to depend on the regular types and the helicopter for short hops and airport taxi service.

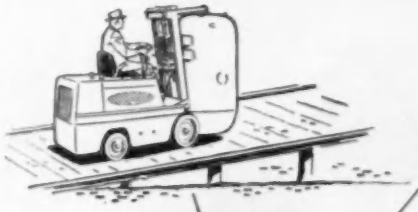
BOOKS . . .

ELECTRO-TECHNOLOGY, *by M. G Say, published by Philosophical Library, Inc., 15 E. 40th St., New York 16, N. Y. Price, $6.00.* This book presents in concentrated form the electro-technical basis of the phenomena which are important in light and heavy electrical engineering. An introductory section deals with conduction and magnetic and electric field effects, and a comprehensive list of definitions is given. The rationalized m.k.s. system of units is used throughout. The second part of the book gives a complete guide to the handling of circuit problems. Two-terminal and four-terminal cases are dealt with, and balanced and unbalanced three-phase circuits. A feature is the collection of network theorems, which should be of great help to those who have to work out electrical quantities in all types of circuits and networks.

EVERYTHING AND THE KITCHEN SINK, *published by Farrar, Straus & Cudahy, 101 Fifth Ave., New York, N. Y. Price, $4.00.* This is the story of progress and the makers of progress, of the men who have made possible American civilization as it is today and who have built the basis of an even better future. History affords ample recognition of the great statesmen, soldiers and inventors whose leadership and creativeness helped build America. But little acclaim has been given the dynamic men who have made things that benefit the people. This is a story of the ingenuity, initiative and foresight these men of progress possessed and of the almost unbelievable results they achieve. A salute to the automotive industry and its part in creating modern America is given in a chapter entitled "The Tempestuous Twenties."

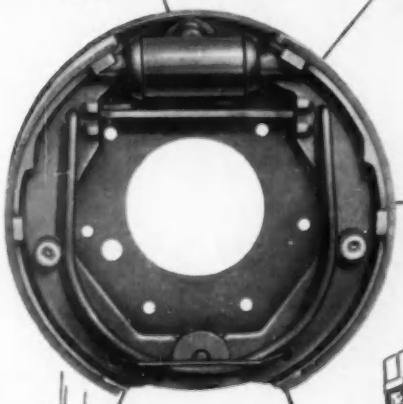
IF IT MOVES

WE CAN STOP IT!



TDA BRAKES

...for every industrial or automotive application where braking is required!



FSH... Floating Shoe Hydraulic Brake
Designed for close control with heavy loads

The FSH Brake presents some remarkable new advantages to manufacturers who need a better, longer lasting Hydraulic Brake. The features of the FSH were developed after years of field work and laboratory study. These advantages can be a road to new economy and better control for *your* equipment.

FSH Brake shoes operate with a floating action. This eliminates the danger of liner loads concentrating at one point . . . permits the shoe to follow the drum. The result of this even load distribution is a highly dependable, controllable brake—*in either direction* of travel. This is especially important when stacking heavy loads at high levels and maneuvering at close quarters.

For Additional Information . . . contact the Timken Brake Division. Complete details on the FSH Brake are available. And, a staff of experienced engineers can assist you with any brake problem you encounter.

Mechanical Parking Brake Hook-up

A separate parking brake is no longer necessary with FSH. If specified, the FSH Brake can be furnished with a mechanical parking brake linkage that functions independently of the hydraulic system.

Long Life Lining

Brake lining is bonded to the shoe to give maximum lining area with no lining waste.

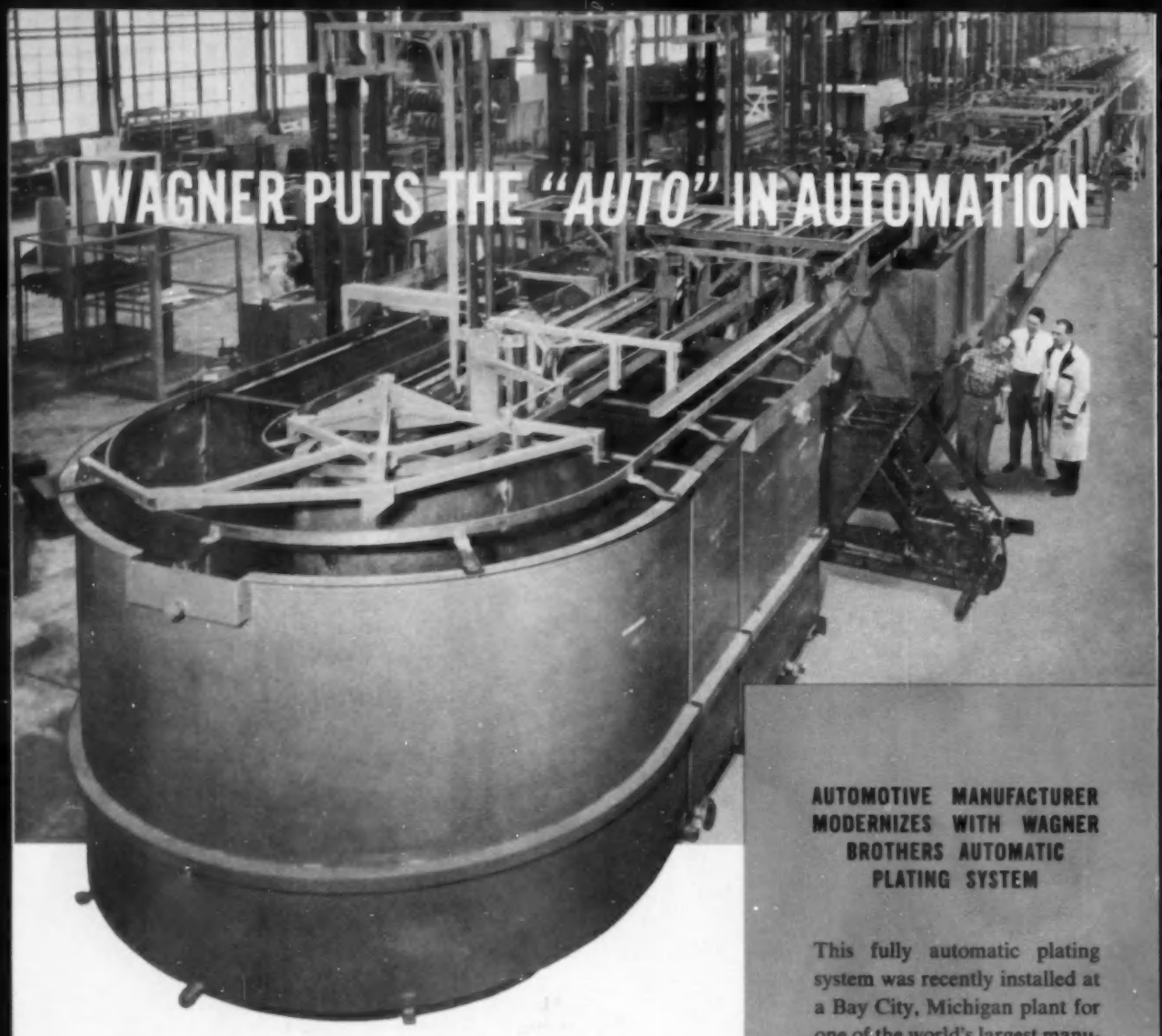
Positive Automatic Adjustment

One application of the foot pedal sets the automatic adjustment. No further adjustment of the brake is required during the full life of the brake lining.

Positive Contact Drum Seal

For applications where a sealed brake is required, the FSH is designed to incorporate a seal between the brake backing plate and brake drum.

TIMKEN Detroit BRAKES
ROCKWELL SPRING AND AXLE COMPANY
Accepted Standard



WAGNER PUTS THE "*AUTO*" IN AUTOMATION

If your metal finishing operations are still being carried on with obsolete equipment which loses money for you every day, we can put you ahead of your competition, increase your profit margin.

Increased production lowers the unit cost of your parts processing operations – you spend less for labor, less for power and increase your capacity to handle more business.

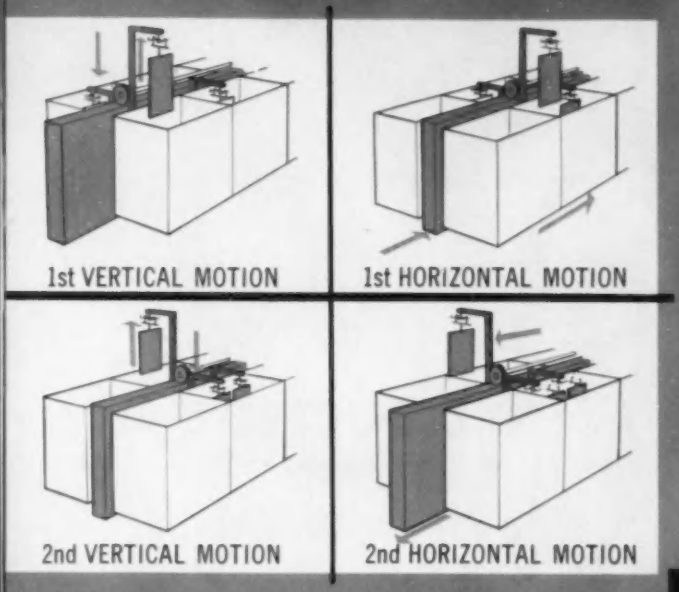
Wagner Brothers Full Automatic* Electroplating systems offer you a new and revolutionary concept in high-volume plating mechanisms – the product of years of engineering research and design refinements – for completely automatic cycling of your metal finishing operations.

*Patents Pending

Basic design details of Wagner Brothers Automatic Plating systems are described and illustrated in Bulletin 50-54, available free upon request.

AUTOMOTIVE MANUFACTURER MODERNIZES WITH WAGNER BROTHERS AUTOMATIC PLATING SYSTEM

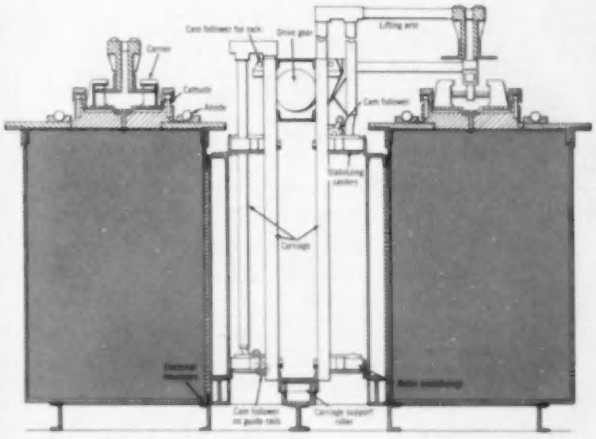
This fully automatic plating system was recently installed at a Bay City, Michigan plant for one of the world's largest manufacturers of passenger cars. The unit is 203 feet long, 11 feet wide and operates under 16-foot head-room. Die cast parts are continuously processed through a 40 station copper-nickel-chromium cycle. Production rate is 100 racks per hour, using racks 24″ long, 10″ wide and 64″ deep. Power is furnished by one 25-HP motor. Unit is provided with a push-button central lubrication system, built-in rack stripper, vertical and horizontal agitation. Racks are automatically loaded, unloaded.



HOW IT OPERATES

All transfer and conveying mechanism is mounted on a reciprocating carriage located between the two rows of tanks. Two basic movements bring parts through the full plating cycle, one forward and reverse straight line horizontal motion and one raising and lowering vertical movement.

Plating racks are attached to work-carriers at the loading station. When the machine is started, lifting arms fixed to the carriage engage the work-carriers being transfered and lift them at all points on one side of the machine, carry them forward to the next station where they are lowered and disengaged from the lifting arm. Sequence is simultaneously produced in reverse on the opposite side so that, when lifting arms are lowered on one side, they rise on the other side.



The entire carriage mechanism is suspended on rollers moving in an oil-filled channel track. This carriage is motivated by a hydro-motor mounted at the base of the machine, fitted with a crank and link to translate the simple harmonic motion of the motor shaft to the in-line reciprocating action of the carriage.

ADVANTAGES and FEATURES

SMOOTH OPERATION — Hydromotor power principle *eases* parts through the plating cycle without jolting starts and stops. Parts never jar from work-carriers into tanks.

LOW POWER NEEDS — Almost perfect balance of work load being lifted at one time requires only *low hydraulic pressures*. One 25-HP motor operates the 203 foot automatic shown.

SIMPLE INSTALLATION — Automatics are delivered to your plant either intact or in 2 or 3 completely assembled sections, depending upon size. *You avoid costly installation.*

MINIMIZED MAINTENANCE — There are fewer moving parts, no vibrating parts, no backlash in automation, low hydraulic pressures, no alignment problems. Overload protection is built into the hydraulic pump. Working parts are easily reached without disassembly.

OTHER FEATURES —

OPERATES UNDER LOW HEAD-ROOM REQUIREMENTS • NO OIL-DRIPPING CONNECTIONS OVER TANKS • TRIPLE CONTACT CATHODE BARS FOR SMOOTH CURRENT FLOW • AUTOMATIC HEAT CONTROL FOR ACCURATE RESULTS • CENTRAL LUBRICATION SYSTEM • EASILY VARIED DRAG AND DWELL TIME

In addition to high-volume plating, the Wagner Brothers Automatic is equally-well-suited to anodizing (sulfuric and chromic), phosphate coating, etching, electropolishing, oxide coating, etc.

WAGNER
BROTHERS, INC.
400 MIDLAND • DETROIT 3, MICH.

LEVER PENDENT CONTROL (illus.)

Also Push-Button or Cable Control

There's a speedy dependable

ARO

PRODUCTION AIR HOIST *to fit your job!*

2,000 lb.
1,500 lb.
1,000 lb.
500 lb.
300 lb.
100 lb.

VARIABLE SPEED . . . 1000 lbs., 0 to 38′ per minute . . . 2000 lbs., 0 to 20′ per minute . . . load can be inched or zipped.

AIR-POWERED FOR SAFETY . . . no spark hazard . . . explosion-proof motor . . . can't burn out . . . can't overheat . . . unaffected by dust or fumes.

LIGHTWEIGHT . . . only 28½ lbs. for 1000 lb. hoist . . . 2000 lb. hoist weighs only 47 lbs. Overall length all models, 10½″ to 11⅛″.

TRY THIS WITH ANY OTHER HOIST!

You can inch so slowly that you can touch an egg without breaking it!

ARO AIR HOIST

Also . . . Air Tools . . . Lubricating Equipment . . . Aircraft Products . . . Grease Fittings

SEE YOUR ARO DISTRIBUTOR

THE ARO EQUIPMENT CORPORATION

Bryan and Cleveland, Ohio

Aro Equipment of California, Los Angeles, Calif.
Aro Equipment of Canada, Ltd., Toronto 15, Ontario

Offices in All Principal Cities

Bright as tomorrow!–Right for the years!
SUPERIOR
stainless strip steel
The sparkle that catches the car buyer's eye is a *permanent* pleasure with Superior Stainless. Time can't dull the brightwork made of this solid-bright metal. Superior Stainless Strip Steel is the dress-up feature that helps make the sale —and through superior performance, helps keep each owner sold. • Let us give you the facts on fabricating ease, gauges, tempers, finishes and coil widths for your needs.
Superior Steel
CORPORATION
CARNEGIE, PENNSYLVANIA

air-conditioned cover keeps new clutch c-o-o-l

Frictional heat has little effect on the new *Lipe* Direct Pressure Clutch. Air circulating through the cover's 33 ventilating holes dissipates heat rapidly. The result is a heavy-duty clutch singularly free of burned facings and warped pressure plates. A clutch whose low maintenance cost matches its low first cost.

Lipe Direct Pressure Clutches now available: 13", 14", 15" single-plate, 14" and 15" two-plate. Send for complete information.

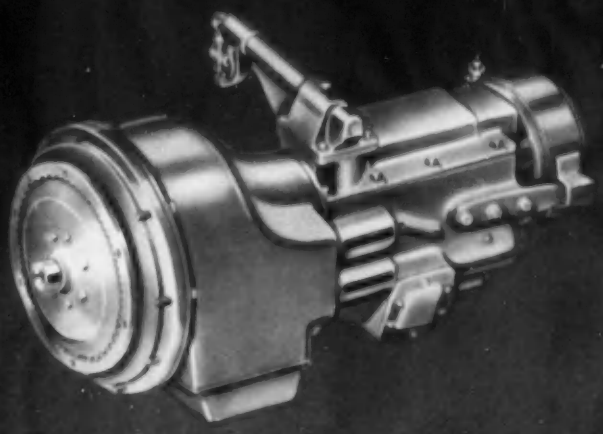
For the name of your nearest Authorized Lipe Distributor, look under "Clutches" in your telephone directory. Or, write us.

Manufacturers of Automotive Clutches & Machine Tools

LIPE ROLLWAY

Lipe-ROLLWAY CORPORATION SYRACUSE 1, N.Y.

Vastly reduced shifting with TORCON Package Torque Converter-Transmission



You profit substantially by using this TORCON "package" torque converter and transmission:

- operational shifts vastly reduced
- 3-to-1 torque multiplication as needed—smooth, cushioned power
- longer life of transmission
- maintenance greatly reduced by fewer shifts, longer life

TORCON'S broad line meets every power-transmission need.

You'll find the Torcon bulletin helpful.

CLARK EQUIPMENT COMPANY • JACKSON • Buchanan, Battle Creek and Benton Harbor, Michigan

CLARK® EQUIPMENT

NOW...MORE WORK with HYDRATORK!

Clark Carloader sets new standards for the industry!

NEW! Increased engine power gives you faster acceleration, faster travel speeds, power reserve for extra work-loads.

NEW! Faster lifting speeds. Lifting speed when loaded has been increased to 37 feet per minute.

NEW! Improved Hydratork Drive has greater gear reduction to convert higher engine speeds for more power.

NEW! Top gradeability. The most efficient operating power-train on the market today, provides power when you need it to climb the steepest grades.

No clutch—no gears to shift gives you better maneuverability, less driver fatigue—MORE WORK! Power multiplication through torque converter gives you extra power, smooth acceleration—MORE WORK! No clutch means easier driving, less down-time—MORE WORK! Any way you look at it . . . you'll get *more* work with Clark's Hydratork Carloader. Ask your local Clark dealer for details.

A BETTER BUY WITH LOCAL SUPPLY—*Genuine Clark Parts*

Industrial Truck Division
CLARK EQUIPMENT COMPANY
Battle Creek, Michigan

CLARK EQUIPMENT

THE BUSINESS PULSE

(*Continued from page* 100)

by $6 billion, which accounts for five-sixths of the rise in over-all GNP in that period. All three subdivisions of consumption expenditures—durables, nondurables, and services—were higher, but the greatest relative increase occurred in durables.

Spending Beyond Income

Perhaps the only single feature of third-quarter experience that could be regarded as suspect is the fact that a goodly portion of the rise in spending for durables was unquestionably financed by instalment borrowing. This is evident not only from data on consumer credit outstanding, but can be inferred from the GNP and income estimates themselves, which show that the over-all increase in consumption expenditures of $6 billion for the quarter exceeded the rise in disposable personal income by more than a billion dollars. This tendency for consumers, as a group, to increase their spending by more than the increase in their income, which has been the pattern of the past year, obviously cannot continue indefinitely. This is, of course, one of the primary features of the credit situation with which Administration and monetary authorities have been most concerned. There already appears to have been some qualitative improvement in the situation, however. Dr. Arthur F. Burns, chairman of the President's Council of Economic Advisers, declared in an address delivered in New York City in October that "the widespread tendency toward increasingly liberal credit terms . . . has apparently run its course." He also reported improvement in the quality of consumer instalment loans being made by some important lenders.

Dr. Burns gave the impression of being generally well satisfied with economic conditions in general in his New York speech. After reviewing the credit restraints that have been imposed by the Federal Government and by Federal Reserve authorities, he stated that thanks to these measures "we have succeeded to a considerable degree in keeping them (the excesses of prosperity) in check." In support of this, he cited not only the improvement in the personal credit sector but also called attention to other achievements as well. Specifically, he stated that there had been some improvement in the quality of new mortgage loans, he noted that the rise in brokers' loans had stopped, he declared that loans now being made by commercial banks and other financial institutions seemed to be coming preponderantly from savings, and he noted that prices have continued to move within a narrow range. Besides underscoring these "significant signs of progress in the struggle to maintain conditions of sustained prosperity in our times," Dr. Burns went on to enumerate a whole series of additional factors which he regards as elements of strength in the present situation. Though the President's top economic adviser did remark that "in an economy like ours, poised on a high plateau, neither the threat of inflation nor of recession can ever be very distant," his speech, as a whole, was very decidedly optimistic. Indeed, one could easily infer from his address that the Government is sufficiently pleased with the progress that has already been made in moderating

YA® Radiators

assure dependable power on this

Oil Well Drilling Rig

In isolated oil fields where water scarcity presents a terrific problem . . . only with radiators can you save and conserve water used on these giant drilling rigs. And builders of drilling rigs have found YA Sectional Cast Tank Radiators the answer for assured dependability and water conservation.

These 6 section radiators permit easy repair in the field. Any section damaged can be removed for repair, and replaced in the meantime for continued operation.

If you are a builder of heavy duty machinery, Yates-American will be glad to work with you in building radiator equipment to fit your specifications.

California Representative: E. E. Richter & Son, Emeryville, Cal.

YA® Heat Transfer Products Division

Yates-American

BELOIT, WISCONSIN

BRANCH OFFICES: CHICAGO, ILLINOIS; HIGH POINT, NORTH CAROLINA; MEMPHIS, TENNESSEE; PORTLAND, OREGON

YOU NAME IT-

FELT

by FELTERS

will do it...

Filters
Auto parts
Washers
Noise dampeners
Wicks
Packings
Liners
Electrical appliances
Aircraft parts
Shock absorbers
Vibration controls

(Your product goes here)

Resiliency that permits constant spring-back to original shape . . . and good absorptive characteristics . . . are just two of the many properties you can get in Felt made by Felters.

If you have a problem that could be solved by a soft, porous material, or by a hard, dense material — your answer could well be a Felt made by Felters.

The "Felters Design Book" describes several usual and unusual uses for Felt. Drop us a line and we will send you a copy.

HEARD ABOUT **UNISORB®** *— THE MODERN MACHINERY MOUNTING?*

The **FELTERS** Company
253 South Street, Boston 11, Mass.

the boom as to render additional restrictive measures unlikely in the near future. This is indeed the meaning that many people have given to his remarks.

Federal Reserve Authorities Proceed With Caution

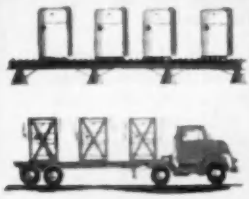
This judgment has been buttressed, moreover, by the recent actions of Federal Reserve authorities. When private lending rates were advanced by another notch in October—including the so-called prime rate—not only did Federal Reserve officials fail to advance the rediscount rate, as they might conceivably have done, but they actually facilitated the seasonal expansion of credit by modest purchases of Treasury bills. It would probably be unwise to read too much significance into this behavior, but it seems noteworthy that some observers have concluded that it implies either that monetary authorities are satisfied with the restrictive measures already taken or that they are not yet sure how the situation is working out and hence wish to proceed with caution.

It is entirely conceivable that recent developments in home building are operating to persuade officials that they have gone far enough with restrictive measures for the time being. New housing starts have dropped off quite sharply in recent months, as have FHA mortgage applications and requests for VA appraisals. Some builders have begun to complain that a considerable drop in home building will occur in 1956 unless restraints are eased.

BOOKS . . .

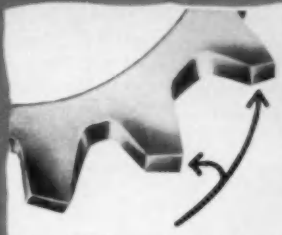
ELECTRONICS IN BUSINESS, *published by Controllership Foundation, Inc., Two Park Ave., New York 16, N. Y. Price, $2.00.* This annotated bibliography lists and describes the writings, speeches and visual presentations on the subject but also gives essential facts about existent electronic data processing systems. In addition, it lists installations in use according to company and now includes a directory of commercial digital electronic computer centers whose facilities are available on a commercial fee basis. The descriptive matter on electronic data-processing systems includes the manufacturer's name and address; general characteristics; selling price or monthly rental; operating characteristics; code and reading speed of punched paper tape; storage capacity, access time and RPM of magnetic drum; speed of basic arithmetic operation; physical characteristics, such as dimensions, power erquirements and cooling method, and such general information as training of operating personnel, maintenance and delivery schedule.

Why SHAKEPROOF® LOCK WASHERS defeat vibration!

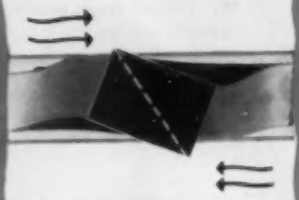


The purpose of lock washers is to keep screws and nuts tight.

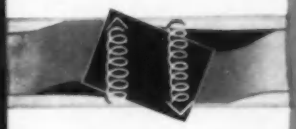
Shakeproof Lock Washers provide positive locking action that ordinary washers cannot give.



Only Shakeproof Lock Washers have these exclusive tapered-twisted teeth . . .

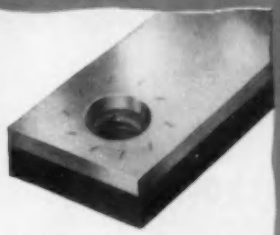


where each tooth is a strut to resist all loosening rotation of threaded fastening.



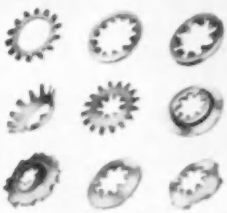
Spring tension forces the edges of each tooth to bite deeper.

Shakeproof Lock Washers lock tighter as vibration increases . . .



and the locking power of each tooth is multiplied by the number of teeth.

Their exclusive mechanical lock resists loosening as no other lock washer can!



To meet the majority of your locking needs, there are nine standard types.

The variety and styles of "specials" to meet individual requirements are unlimited!

For maximum savings, buy Shakeproof Lock Washers pre-assembled on screws as SEMS.

Pre-assembled on nuts, Shakeproof Lock Washers save time—specify KEPS®.

Free Sample Kit

Now . . . make your own tests! See for yourself how SHAKEPROOF Lock Washers can save time in assembly and protect the quality of your products. Write for your free sample kit today!

SHAKEPROOF

"Fastening Headquarters"®

DIVISION OF ILLINOIS TOOL WORKS

St. Charles Rd., Elgin, Illinois • Offices in Principal Cities

In Canada: Canada Illinois Tools Limited, Toronto, Ontario

WORLD'S BROADEST LINE OF MASS-ASSEMBLY FASTENINGS

Aircraft Production Forum

Highlight of SAE Aeronautic Meeting

(*Continued from page 53*)

New developments: (1) A seat to simulate airplane vibration to educate pilot on acceptable engine vibration — will aid airplane acceptance. (2) Use of large forgings and high strength weldments saves weight and number of parts. They make construction problems greater — but not insoluble.

Landing Gear

Most significant fact: Higher tensile strengths in order to reduce weight and space requirements.

General trend in the field: Increasing tensile strengths toward the 350,000 psi range.

Most interesting problem — how solved: How to coordinate design before final release? Assembly and production people should get to the engineering department early.

New developments: Ultrasonic inspection — assists in flow time. Electrolytic and electronic grinding and machining. Development of forged magnesium and titanium wheels and improved tire shapes.

Plastic Tooling

Most significant fact: Plastic materials are being used to make stable, accurate tooling masters. One company reported a tooling program based completely upon masters, using splined epoxy facing and plastic internal structure.

General trend in the field: Use of epoxy resins for masters, form dies, trim and drill fixtures, and check fixtures. Paper honeycomb with epoxy laminate surfaces being used for tool bases, surface tables, straight edges, and tooling bars, as well as other tooling approaches.

Most interesting problem: A splined plastic - surfaced mock - up which showed surface delamination from the base coat. Several opinions were offered as to what may have caused the condition. But nothing definite came of it.

New developments: (1) Use of electric heating tape and high temperature epoxy resin. Both radome curing dies and dies for forming plastic enclosures have utilized this plastic tooling application. (2) Use of plastic-faced metal core tooling for drop hammer, draw dies and stretch dies. One company reported 80 per cent of this type of tooling was used on a new tooling problem. Minimum time spreads resulted since the dies did not require surface grinding to a contour.

Plant Layout

Most significant fact: No matter how good the plans and techniques are for a layout, their success depend on how well they are sold by the layout engineer.

General trend in the field: Swing from a high percentage of inside square foot area for assembly operations to a higher percentage of fabrication operations . . . a result due to newer types of aircraft.

Most interesting problem — how solved: How to coordinate plant layout plans with all personnel involved. Solved by (1) advance notice of a move outlining all details and responsibilities; (2) pre-move meetings held with all concerned; (3) assignment

(*Turn to page 126, please*)

RUGGED ACCURATE

DETROIT "Vernatherm" CONTROLS

...for BIG Engine Cooling!

"Vernatherm" means a solid-charged thermostat which will take all the punishment that big engines and rough duty can give it, and give positive, precise coolant control *indefinitely!*

These thermostats were pioneered by Detroit Controls Corporation to meet the requirements of modern pressurized cooling systems. They have provided the answer to a great number of tough problems on Diesel, heavy-duty gasoline and jet engines. "Vernatherm" controls might be the solution to a situation in *your* engines . . . Call on DETROIT sales engineers for test data and actual results in the field . . . or write for Bulletin 213 which gives basic data on "Vernatherm" controls and their function in modern engine design.

DETROIT CONTROLS CORPORATION
6900 TRUMBULL AVE. • DETROIT 8, MICHIGAN
Division of AMERICAN RADIATOR & STANDARD SANITARY Corporation

Representatives in Principal Cities
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AUTOMATIC CONTROLS FOR REFRIGERATION
AIR CONDITIONING • DOMESTIC HEATING • AVIATION • TRANSPORTATION • HOME APPLIANCES • INDUSTRIAL USES

NEW

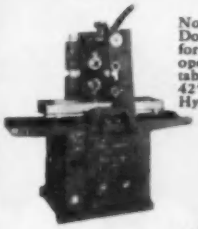
No. 3-36
HYDRAULIC MILLING MACHINE

Now—the family of Kent-Owens Milling Machines has expanded to give you the same unexcelled milling accuracy, speed and dependability for *larger size work!*

Proudly we present the No. 3-36 Hydraulic Milling Machine . . . the new "big brother" in the line of popular Kent-Owens Millers. Each Kent-Owens machine is ruggedly designed with advanced features throughout for greater dependability and accuracy to maintain tough production schedules. Write for bulletin 955 on wide range of hydraulic and hand-operated machines. Also, let Kent-Owens design and build your tooling and special machines.

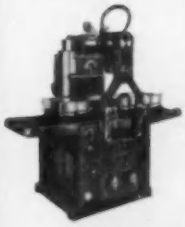
Kent-Owens Machine Co., Toledo, O.

Simple . . . Rugged . . . Efficient



No. 2-20DS . . . Double Spindle for two milling operations . . . 20" table travel . . . 42" x 12" table. Hydraulic feed.

No. 1-14 . . . 14" table travel . . . 32" x 9" table . . . hydraulic table feed . . . full automatic cycle.



No. 2-20 . . . 20" table travel . . . 42" x 12" table . . . full automatic hydraulic feed.

No. 1-M . . . Hand feed to table and head . . . 25" x 9" table . . . 12" table travel . . . head counter-balance is adjustable.

Call on

KENT-OWENS
for MILLING MACHINES

KENT-OWENS REPRESENTATIVES

it's the greatest advancement in OBI press history

NIAGARA FRONT-TO-BACK

- ***ALL NEW*** rugged, front-to-back crankshaft with huge crankpins
- ***ALL NEW*** compact, fully concealed driving mechanism
- ***ALL NEW*** enclosed, rigidly supported gearing in sealed oil bath
- ***ALL NEW*** electro-pneumatic friction clutch on crankshaft
- ***ALL NEW*** wider spaced, longer, narrower gibs
- ***ALL NEW*** wider, box type slide all within gibbing
- ***ALL NEW*** precision, hardened, longer-wearing gears
- ***ALL NEW*** compact, straight-line, space-saving frame

Hailed as the greatest achievement in modern OBI press design and performance, by over 100,000 spectators who examined this mechanical marvel at the Machine Tool Show, the all-new Niagara Series E, Single Point, Open Back Inclinable Press starts a brand new chapter in press history.

It's years ahead of any OBI ever built. It's an industrial revolution all by itself. No other press, in modern times, embraces so many "All-New" features.

Gone are exposed, overhanging gears, flywheel and other mechanisms. Gone is excessive and damaging crankshaft deflection. Here to stay are: Full support to wide dies. Greater resistance to off-center loading. Accurate alignment of slide, with minimized tendency to cock. Substantially increased die life. Longer lasting, hardened gears. Smoother, safer press performance. Smaller floorspace requirements.

Built in 4 sizes, with shaft diameters from 4½ to 7½ inches and capacities from 75 to 200 tons, the new Series E is available in both standard models and automation models equipped with the most advanced controls and devices for peak production. A complete description of both, with full specifications, is given in new Bulletin 56, sent promptly on request.

SEND FOR NEW BULLETIN . . .

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

DISTRICT OFFICES: Buffalo • Cleveland • Detroit • New York • Philadelphia

Dealers in principal U. S. cities and major foreign countries.

America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work.

CRANKSHAFT OBI PRESS DESIGN

STANDARD DESIGN
For General Purpose Production

MODIFIED DESIGN
For Automation Lines

Model MOD OIL-ACTUATED Multiple Plate Clutch (inset) is one of 6 Twin Disc Machine Tool Clutches incorporated in this power driven 8' Rotary Table with 50-ton capacity—manufactured by one of the world's largest machine tool makers, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.

Why 6 Twin Disc Clutches are *standard* on new Giddings and Lewis Rotary Table

For *more constant* torque transmittal . . . *longer* wear life . . . *adequate* capacity in a small package . . . *elimination* of adjustment . . . and remote control at *minimum cost*—Giddings & Lewis uses *six* Twin Disc OIL-ACTUATED Multiple Plate Clutches as standard equipment for their new power driven 8' rotary table with 50-ton capacity. Included are: (1) Model MOD-806 and (2) Model MOS-806's on feed drive, with (3) MOS-806's on main transmission.

The Models MOS (single) and MOD (duplex OIL-ACTUATED Multiple Plate Clutches are Twin Disc's answer for a high energy, high inertia, high horsepower clutch especially adaptable to applications creating high temperatures and operating under heavy, abusive loads.

Both models are readily adaptable to remote or push button control without mechanical linkage. Since the floating or pressure plate forms the ram of the cylinder, ram travel increases automatically as plate stack wears. This eliminates adjustments to compensate for plate wear and constant torque transmitting ability is thus provided during entire life of clutch plates.

Find out how these OIL-ACTUATED Multiple Plate Clutches can be applied to your machines—write today to Twin Disc Clutch Company, Racine, Wis.

TWIN DISC

TWIN DISC Clutches

Aircraft Production Forum

(*Continued from page* 122)

of a coordinator to supervise the actual move; and (4) holding post-move meetings to pick up all omissions in the move and to correct errors.

Highlights of some of the papers presented:

"Fatigue and Fail Safe Airframe Design," by J. F. McBrearty, chief structures engineer, Lockheed Aircraft Corp., covered the two principal approaches for providing safety against catastrophic aircraft structural fatigue: the safe life and fail safe methods.

Mr. McBrearty finds: (1) Safe life method in any of its forms is impractical as a means of preventing catastrophic failure from fatigue and inadequate in preventing catastrophic failure from other reasonable causes.

(2) Fail safe method of structural design is a practical and sound means of providing reasonable safety against complete failure from fatigue or other sources of damage.

(3) From the fail safe standpoint, 2024 is superior to 7075 aluminum alloy.

(4) For a given crack or damage, the stress level in the undamaged elements is below the ultimate strength of the material, as expected, but the indicated weight penalty can be minimized by suitable design practices.

(5) Water testing of submerged pressure cabins may be desirable for ultimate strength testing when required, or for fatigue testing when necessary. But it is undesirable for fail safe tests and impractical for proof tests.

(6) Dynamic effects in fail safe tests appear to be small.

(7) Fatigue cracks can be simply and faithfully simulated in fail safe tests.

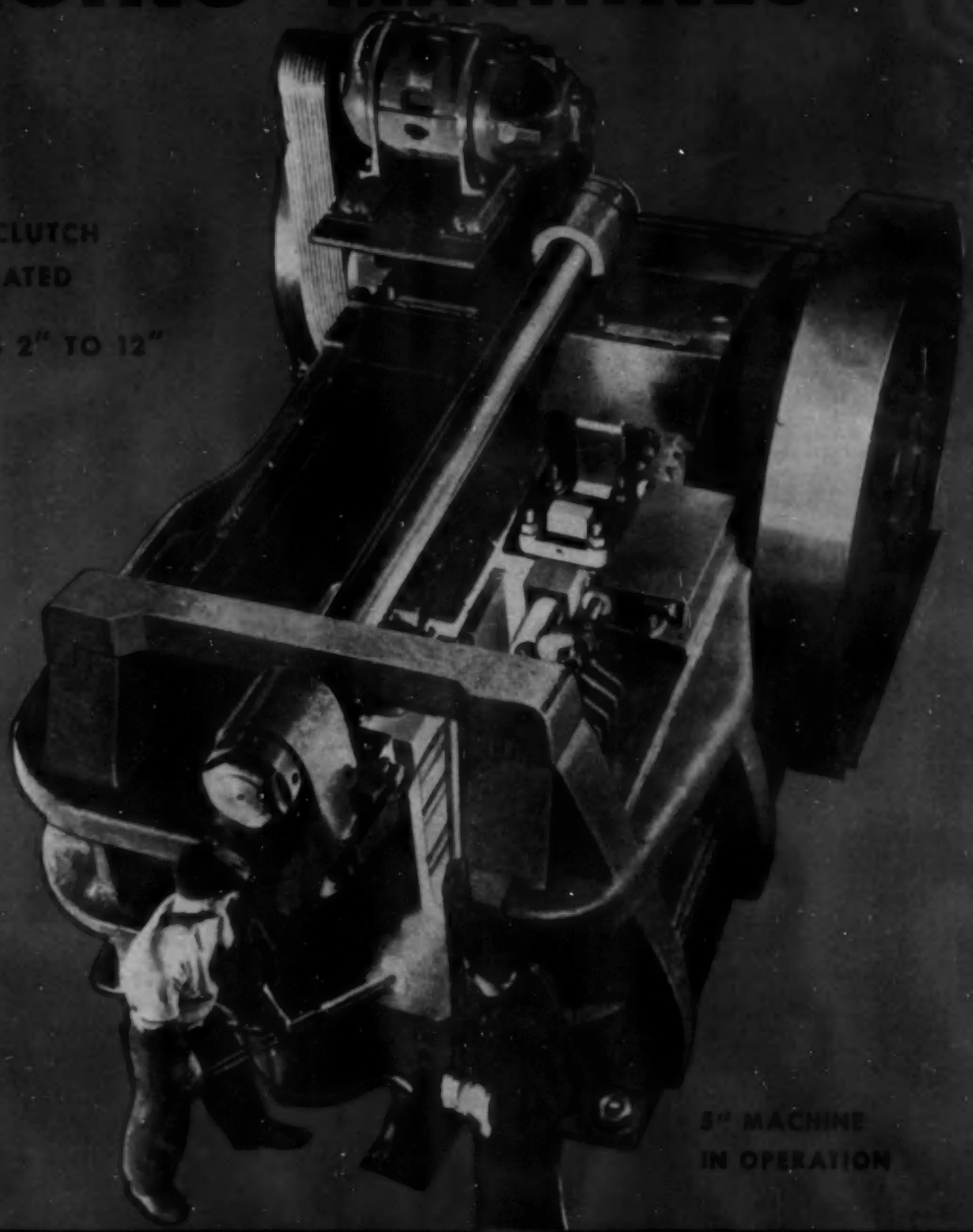
In an interesting paper on flexible suspensions for turboprop and turbojet power plants, Jack Rebman, Lord Manufacturing Co., points out that the turbine power plant is a fragile device that has inherent vibratory disturbances. He feels flexible suspension holding the power plant in the airframe must protect one from the other. To do so, the suspension must, without size, weight, and complexity disadvantage to the installation: control natural frequencies to limit vibration transmission; hold the power plant in the airframe through ultimate load conditions; distribute loads

AJAX

FORGING MACHINES

AIR CLUTCH
OPERATED

SIZES 2" TO 12"



Write for Bulletin 63-D

3" MACHINE
IN OPERATION

THE AJAX MANUFACTURING COMPANY
EUCLID BRANCH P. O. CLEVELAND 17, OHIO
110 S. DEARBORN ST., CHICAGO 3, ILL. • DEWART BLDG. NEW LONDON, CONN.
W. P. WOOLDRIDGE CO.
1209 BURLINGAME AVE., BURLINGAME, CAL. • 6440 FLEET ST., LOS ANGELES 22, CAL.

into a desirable pattern; maintain stability; provide adequate service life; and permit simple installation and removal.

There are many power plant, airframe, and general installation factors which contribute to these characteristics. Mr. Rebman presented data on the use of these factors and their effect.

Air bled from the compressors of some high-compression-ratio turbojet engines is contaminated because of internal engine oil leakage into the compressor air. This trouble got the attention of Henry A. Reddall, North American Aviation, Inc., in a paper "Elimination of Engine Bleed Air Contamination."

External leakage of oil or other fluids, where such fluids can leak into the engine air inlet, can also cause contamination. Mr. Reddall reports two positive methods of elimination: (1) A catalytic filter which oxidizes the contaminants to carbon dioxide and water. (2) A separate cabin compressor that compresses free stream ram air for cabin air conditioning and pressurization.

The method of extracting air from a location in the engine where the compressor air is least contaminated is considered a marginal solution to the contamination problem on some of the present high-compression-ratio engines. This method of elimination is worth consideration if a marked improvement is realized in the design of the engine components that contribute to leakage.

Now that aircraft have achieved supersonic speeds, a major problem is to devise practical ways of slowing them to safe landing speeds, according to John H. Povolny and Jack G. McArdle, National Advisory Committee for Aeronautics. In shortening landing runs, thrust reversal appears to be more efficient than drag chutes. High thrust reversal is achieved without jet attachments by using tail pipe cascades.

Light-weight stores are subject to higher accelerations than now specified for determining the strength of airborne stores and suspension systems in landing conditions. While this discrepancy may not result in damage to the store suspension system, which may be critical for the heavier stores, it can result in service damage to the stores themselves or components carried in them. So says S. B. Pfeiffer, design specialist, strength group, Douglas Aircraft Co., Inc., El Segundo, Calif.

The range of test data on dynamic store loads from landing—extremely limited—cannot outline a strength envelope for the many physical configurations existing. In contrast to this lack of data, a status report published in 1952 listed no less than 38 NACA publications relating to the aerodynamic loads of external stores or nacelles.

Test data reported in Mr. Pfeiffer's paper—primarily a sample of certain landing conditions for particular configurations—indicated the need for additional test work. A parametric study aimed directly at store loads from landing would provide extremely useful information by determining the relative importance of the various factors involved in dynamic store loads from landing.

E. H. Spaulding, Lockheed Aircraft Corp., says use of lighter springs of limited life is one way of reducing airplane weight. Explaining that some springs operate only a few times during each flight, he claims that life limits of 300,000 cycles can be both safe and satisfactory.

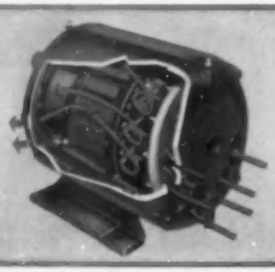
L. H. Schreiber, Convair Div. of General Dynamics Corp., described the need for environmental controls on bombers and transports operating at supersonic speeds in high alti-

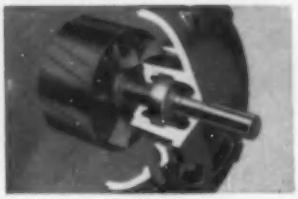
To AUTOMOTIVE ENGINEERS, Howell suggests

What to look for in the new Rerated Open Motors

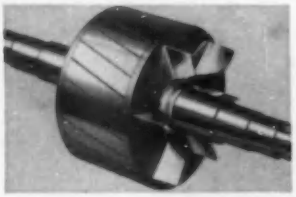
Besides the compactness, lighter weight to handle and ship, and the lower cost in many h.p. ratings that the rerated motors give you, why not look for evidences of *all-around* modernization in motor design? New ventilation principles, real streamlining, and better bearing protection, for instance. Compare the Howell Series 100 motors — a few details on the open drip-proof construction are shown below — and you'll *have* what you're looking for!

VENTILATION . . . "Cool running" means long life in motors. The steel shell of a Howell motor and a new stator design with the largest air passages yet devised put ample ventilation where it's needed. Compare!





BEARINGS . . . They should be fully protected. Dirt can't enter Howell's double shielded bearings either from inside or outside the motor, because they are sealed in the end plate cavities by dust-tight inner caps. Compare!



COPPER-CLAD ROTORS . . . Howell motors have copper-clad rotors. This means better heat conductivity, stability at high temperatures and, as opposed to die-cast rotors, greater design flexibility to meet your special requirements. Compare!

In addition to the open-drip type shown here, Howell Series 100 motors are made in splash-proof, weather-protected and TEFC enclosures, also as the power units of Howell gearmotors and brake motors.

WRITE FOR BULLETIN B-100-B

HOWELL MOTORS

HOWELL ELECTRIC MOTORS COMPANY, HOWELL, MICH.

Precision-Built Motors for Industry Since 1915

HOWELL Red Band MOTORS

50% Reduction in Shaving Time

of CROWNED INTERNAL GEARS by NEW PLUNGE-CUT PROCESS

TYPICAL CROWN-SHAVED TOOTH CONTACT AREA

This typical internal automatic transmission gear is crown-shaved in 24 seconds machine time with the tooling shown.

Amount and position of crown for any specific work unit is optional.

The Plunge-Cut Process is equally applicable to straight-tooth gears and with the same economy in shaving time.

If you are mass-producing internal gears, write for Bulletin S55-6 on Internal Gear Shaving Machine, Model GCR

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

CONSTRUCTION
AIRCRAFT
METALWORKING
MATERIALS HANDLING
PETROLEUM
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MARINE
CHEMICALS
RAILROADS
for every application...
"Custom-Engineered"
US AXLE SHAFTS
MANUFACTURING shafts to carry vital work loads in practically every type of machinery calls for experience, skill, and metalworking facilities of the highest type. The U.S. Axle Company has achieved these requirements in 35 years of specialized precision manufacture of shafts for automotive and industrial use. In our huge modern plant, skilled U.S. metal engineers and craftsmen will produce any type or size of shaft to your exact specifications—accurately and economically.
Send us your blueprints and specs for prompt quotation on a "Custom-Engineered" U.S. Axle Shaft to meet your needs.
Write for this colorful illustrated folder today.
THE US AXLE COMPANY, INC.
Since 1920. • Pottstown, Pennsylvania

tudes. He explained that progress must be made in designing, building, and installing air-conditioning systems, which add to plane weight.

Design and development of high-pressure, high-temperature pneumatic ducting systems for aircraft got the attention of W. M. Cattrell, research group engineer, Ryan Aeronautical Co. He emphasized that the design of aircraft ducting systems should be undertaken with a keen awareness of all the complex design problems involved. If proper consideration is not given to each of the important design considerations, the system will have shortcomings which may be time-consuming and costly to correct.

And in the interests of economy, Mr. Cattrell recommended proceeding at once with the standardization of duct sizes, wall thicknesses, bend radii, and qualification tests.

How to make transport planes independent of ground aids and largely self-contained? Some answers came from J. L. Bartlett and P. C. Scofield, AiResearch Manufacturing Co. They suggested installation of auxiliary gas turbine engines to provide electric power, engine-starting facilities, air-conditioning, and an energy cource useful on the ground. Present planes are too dependent on ground aids, they said, and, if self-contained, would be more maneuverable and efficient at airports.

Proposal to simplify aircraft instrumentation through integration was advanced by Commander George W. Hoover, U. S. Navy Office of Naval Research. Multiple indicators now installed in planes each report a condition but do not help the pilot quickly to grasp a situation. He recommended combining sensors and computers with indicators to present a signal and display which the pilot can quickly grasp.

Commander Hoover explained that under present conditions the pilot who is trying to spot his location wants only an answer to the main question: "Where am I?" Currently, it takes all these to get that answer: air speed indicator, altimeter, outside air temperature gage, wind direction and velocity, time, a computer, and a map.

"With the development of present computer techniques," Commander Hoover said, "it is quite possible to give the answer to such questions directly, thus eliminating the necessity for mental integration. In other words, rather than indicate each factor, the sensors should feed the values of each factor into a computer which will provide a signal to a proper dis-

(*Turn to page* 134, *please*)

LONG
DESIGNS AND MAKES
THEM
BETTER
HEAT EXCHANGERS
RADIATORS
TORQUE CONVERTERS
CLUTCHES
ENGINEERING
B-W
PRODUCTION
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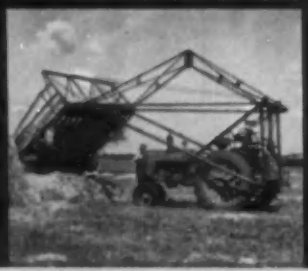
BORG-WARNER CORPORATION
12501 DEQUINDRE STREET
DETROIT 12, MICH.—WINDSOR, ONT.

ANOTHER

Spicer unit for efficient power transmission

IN AGRICULTURE AND INDUSTRY...



Increasing automation of farm and industrial equipment now requires many complex propeller shaft applications in

Post Hole Diggers	**Hammer Mills**	**Elevators**
Manure Spreaders	**Pumps**	**Shredders and Cutters**
Mowing Machines	**Ensilage Cutters**	**Sprayers**
Hay Balers	**Self-Unloading Wagons**	**Hay Rakes**

The problems covering these installations can be solved by Spicer experience in all kinds of power transmission . . . for all types of automotive vehicles.

Spicer originated and developed the automotive universal joint and drive line assembly. Spicer has the men . . . the materials . . . and the machinery to meet the requirements of power transmission units in your equipment.

The Spicer Telescoping Propeller Shaft Assembly has a non-rotating hinge angle to 90°, and clearance for momentary angles up to 60°.

Spicer

DANA CORPORATION • TOLEDO 1, OHIO

THE NEW

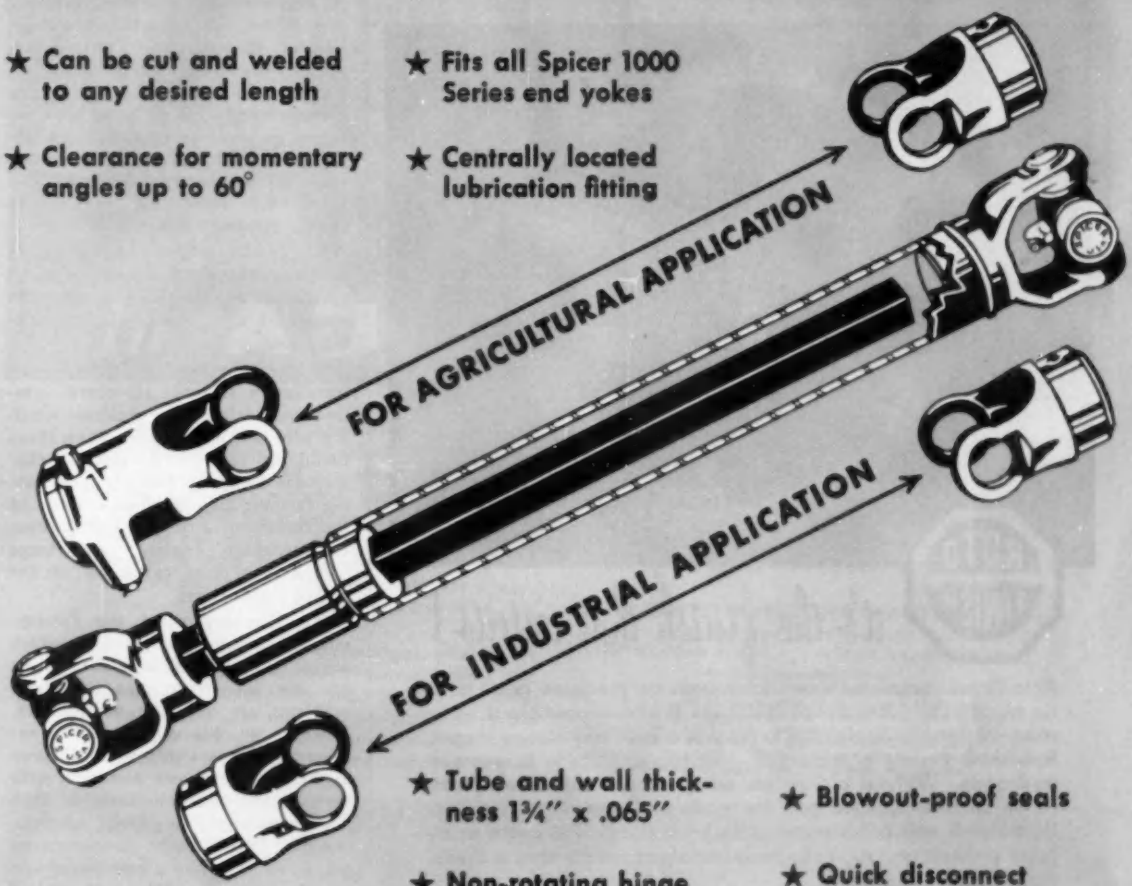
Spicer Telescoping Propeller Shaft Assembly

★ Can be cut and welded to any desired length

★ Clearance for momentary angles up to 60°

★ Fits all Spicer 1000 Series end yokes

★ Centrally located lubrication fitting



★ Tube and wall thickness 1¾" x .065"

★ Non-rotating hinge angle to 90°

★ Swing diameter 1½"

★ Blowout-proof seals

★ Quick disconnect yoke available

★ Needle type bearings

SPICER PRODUCTS: TRANSMISSIONS • UNIVERSAL JOINTS • PROPELLER SHAFTS • AXLES • TORQUE CONVERTERS • GEAR BOXES • POWER TAKE-OFFS • POWER TAKE-OFF JOINTS • RAIL CAR DRIVES • RAILWAY GENERATOR DRIVES • STAMPINGS • SPICER and AUBURN CLUTCHES • PARISH FRAMES

Aircraft Production Forum

(*Continued from page* 130)

play to give a direct answer to the question asked."

New types of pneumatic control devices promise to eliminate a bottleneck in perfecting high speed aircraft, according to Wendell E. Reed, project engineer, Solar Aircraft Co. He described his company's new Microjet control devices, successfully used on after-burners and jet engines.

Mr. Reed pointed out that aircraft now under development—designed to fly at three times the speed of sound—will run up against the thermal barrier. Lowest air temperature to be found anywhere in the aircraft will be 650 F, and engine control devices will reach temperatures of 800 F to 1000 F.

By contrast, he said, "many of the presently available electronic components required for control systems are limited to operating temperatures of less than 250 F. Even highly developed electro-mechanical components, such as electric motors and solenoids, are marginal above 500 F. At 500 F the best known hydraulic fluids begin to decompose. And the most advanced types of plastic materials used for seals become unsatisfactory at temperatures exceeding 600 F.

"Quite obviously," Mr. Reed went on, "the technology of control design and control component materials has not kept pace with military requirements." Pneumatic controls can be designed to withstand higher temperatures. They also have advantages of simplicity, lower weight, reliability, and versatility.

"The Microjet principle has been successfully applied to a variety of jet engine control problems, including afterburner light-off and blow-out detection, turbine inlet temperature control, overspeed control, and afterburner fuel control. Several component configurations have been accepted as standard equipment on late design aircraft and engines. Numerous other applications also have been found for controlling ramjet engines," Mr. Reed reported.

Boeing Airplane Co. aerodynamics engineer M. E. Kirchner explored turboprop airplane control problems associated with engine failure considerations.

Windmilling drag of a turboprop installation presents structural, control, and performance problems which are generally more severe than those found in past reciprocating-engine airplane design. These are contributing factors: high speed capabilities of the turboprop airplane; high powers of turboprop engines; and large torque absorption capability of the engine compressors.

Mr. Kirchner noted the development of turboprop airplanes in which engine powers and airplane speeds are low enough so that the above problems are virtually non-existant. However, in this country, early engine designs available for turboprop application were very powerful, with perhaps too much emphasis on high performance of the initial airplane designs. Consequently, designers were led, all at once, into a new magnitude of gear box, propeller, and control problems. This was undoubtedly detrimental to the development timing of the turboprop airplane in the U. S.

The turboprop is now entering those fields of aviation to which it is most properly suited. Although most installations will remain relatively complex, the development of engine and propeller controls is such that current and future designs should be

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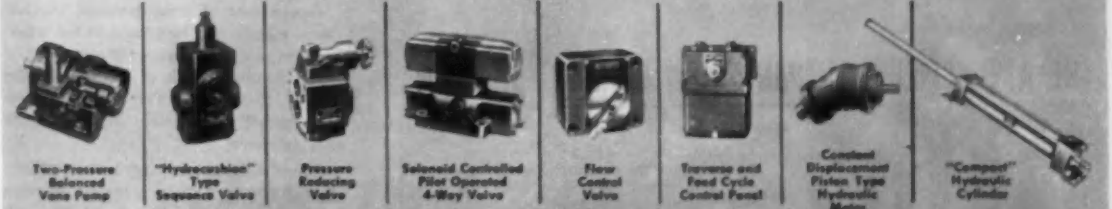

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reasonably trouble-free, Mr. Kirchner concluded.

SAE's 1954 Manly Memorial Medal went to John M. Tyler, Pratt and Whitney Aircraft, and Edward C. Perry, Jr., United Aircraft Corp. They won the honor for their paper "Jet Noise," which showed that jet engine noise is reducible by using less than maximum thrust during take-off.

This year's Aircraft Engineering Display—46 companies showed their wares—was the largest ever held on the West Coast.

Exhibitors: Aeroquip Corp., Aircraft Accessory Turbine Dept., General Electric Co., American Steel & Wire Div. of U. S. Steel Corp., Armco Steel Corp., Bendix Aviation Corp., Boeing Airplane Co., Metal-Cal Div. of C & H Supply Co., The Cleveland Pneumatic Tool Co., Continental Aviation & Engineering Corp., Eastern Industries, Inc., Fairchild Engine Div. of Fairchild Engine & Airplane Corp., Farrand Optical Co., Inc., Foote Bros. Gear & Machine Corp., The Garrett Corp., General Controls Co., Hamilton Standard Div. of United Aircraft Corp., Hi-Shear Rivet Tool Co., Honeycomb Structures Co., Inc., Indiana Gear Works, Instrument Dept., General Electric Co., Jet Engine Dept., General Electric Co., Lear, Inc., Lebanon Steel Foundry, The Liquidometer Corp., Lord Manufacturing Co., Magnaflux Corp., Marotta Valve Corp., Monogram Manufacturing Co., The New York Air Brake Co., North American Aviation, Inc., Pacific Scientific Co., Rohr Aircraft Corp., Rosan, Inc., Ryan Aeronautical Co., Saginaw Steering Gear Div. of General Motors Corp., Small Aircraft Engine Dept., General Electric Co., Solar Aircraft Co., Stratos Div. of Fairchild Engine & Airplane Corp., Sun Electric Corp., Thompson Products, Inc., Titeflex, Inc., United Aircraft Products, Inc., Vickers, Inc., Western Gear Works, Westinghouse Electric Corp., Wyman-Gordon Co.

New $1.7 Million Plant Being Built by Udylite

Operations of three present Udylite Corp. plants will be consolidated when the company completes construction of a new factory north of Detroit by the end of this year. The $1.75 million factory will have about 160,000 sq ft of floor space.

Complete assembly of larger pieces of equipment will be possible in one of the areas of the new plant. At present, these are being built in sections because of restricted space.

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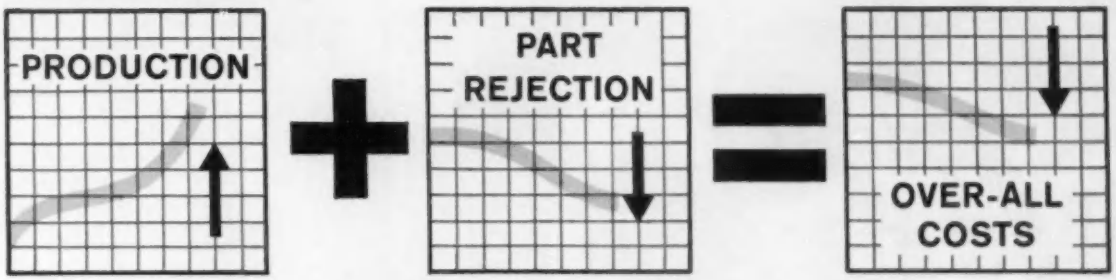

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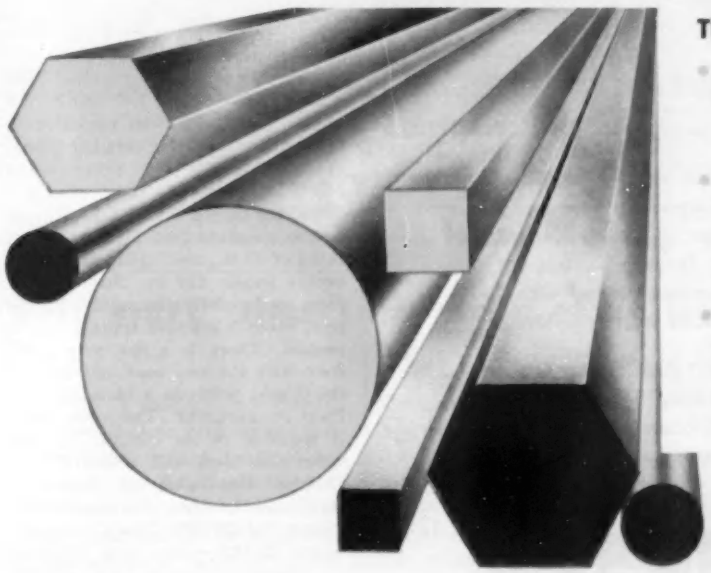

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STEEL CORPORATION — *Pittsburgh*

J&L STEEL

Latest Developments Displayed at

PARIS AUTOMOBILE SHOW

(*Continued from page* 61)

rubber diaphragm.

Although the clutch and transmission are conventional, the clutch pedal has been removed and the conventional gear shift lever has been replaced by a small lever on the instrument panel, just below the steering wheel. Clutch operation is through a hydraulic cylinder which receives fluid under pressure from a distributor connected to an accumulator. The clutch is automatically disengaged when the engine speed falls below a certain predetermined limit. Provision, however, is made for engagement without power to permit starting by towing if occasion arises.

The distributor operating the gear change mechanism consists of two units mounted in series. The movement of one controls the hydraulic engagement of the gear and that of the other controls automatic declutching. A moderator controlled by the accelerator pedal allows of variations in clutch engagement, making it possible to vary from a very slow take up of the drive to rapid engagement.

Brake control is hydraulic for the four wheels, but there are separate circuits for front and rear, each one having its own accumulator fed from entirely different circuits. The brake pedal controls the two distributors which send fluid under pressure from the accumulators to the front and rear wheel brake cylinders. More effort is applied to the front disk brakes, which are cooled by a current of air taken in at the front of the car. Wear of the brake linings is taken up automatically. By means of an equalizer, braking effort on front and rear is correctly proportioned according to load carried front and rear. As a result of this, all four wheels are locked simultaneously whatever the weight distribution between front and rear.

Steering is rack and pinion type, with hydraulic assistance, the liquid being obtained from the main accumulator. Two distributors, operated from the steering column, by means of a revolving connection, admit liquid under pressure to either one or the other face of a piston, according to the movement of the steering wheel. When one face is under pressure, the other is being exhausted.

The DS 19 is a five-passenger automobile weighing 2475 lb with a front tread of 57 in., rear tread 51 in. and overall length 189 in. Body is one-piece steel construction with a plastic roof, which is supplied transparent on request. There is a flat, step down floor, and the two rear cylinders of the engine protrude a little into the front compartment. The spare wheel is mounted in an inclined position under the hood and ahead of the radiator. Headlights are recessed in the fender fairings. Selling price in France is 930,000 francs, approximately $2,540, which puts it above the standard Citroen, but slightly lower than the six which has just been discontinued.

Renault, biggest of the French manufacturers, is continuing with two passenger car models, the rear engine "750" and the 122 cu in. Fregate. For the smaller 750, options this year are

(*Turn to page* 142, *please*)

new!

FASCO LOW PRESSURE INDICATING SWITCH

Automatic "MEMORY" for motorists . . . . . .

"FLASH! . . . DANGER! . . . OIL PRESSURE LOW!" That's the trouble-saving, money-saving warning this dependable new FASCO Low Pressure Indicating Switch never fails to deliver. It's small . . . but it's a BIG factor in keeping the motorist pleased with his car . . . another "plus" sales feature worth considering.

On "public carriers," the "451" FASCO also fills the need for a Low Pressure Indicating Switch for warning of low pressure in the air brake system.

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How Holley engineers measure "cold start" time to a tenth of an icy second

In Holley's continuous research program, all new carburetor and fuel metering designs must prove their operating efficiency in the 20° below zero temperatures of the Holley "Cold Room." Each turn of the crankshaft is reported on a graph similar to the one shown above. Cold weather starting performance and the length of time required to start is pinpointed to the second . . . to the 10th of a second.

The Holley Cold Room test is just one of many successive research steps that each new carburetor or fuel metering device undergoes. Many prototypes are discarded before they ever reach the Cold Room testing stage. Those that do show merit get a rigorous test - - at 20° below zero - - of initial start time, rate of warm-up and operation during warm-up, and cold weather operation at normal engine temperatures.

Out of such exacting tests like the Holley Cold Room and Holley's continuous program of planning, designing and rebuilding, will emerge the carburetors and fuel metering systems for the cars and trucks of tomorrow.

HOLLEY Carburetor Co.

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1-22

NOW!... Norton Offers Further Automation

in Cylindrical Grinding

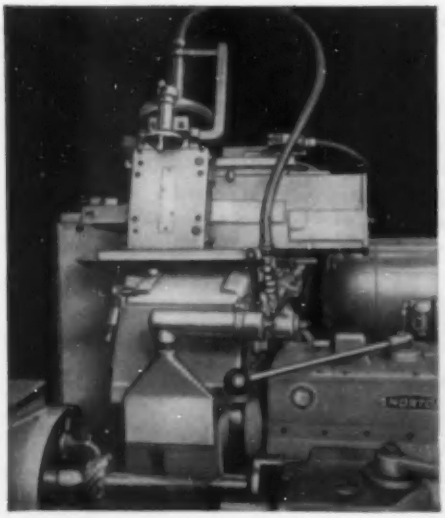
Automatic loading and wheel truing in Type CTU cut the time, work and costs of grinding small shafts.

Automation made one of its most spectacular advancements when Norton brought out the automated crankpin grinder — the sensational machine that adjusts, grinds, gauges and transfers entirely automatically.

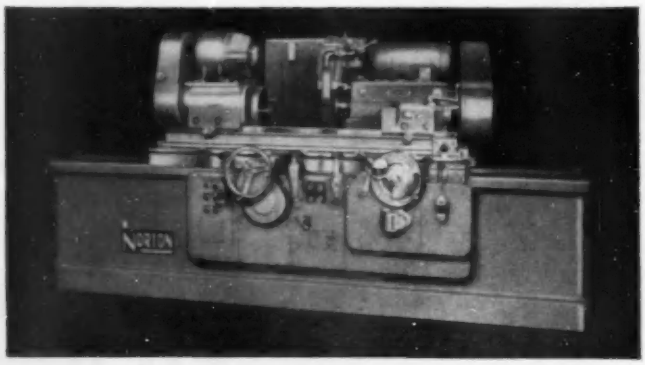
Now Norton is happy to announce further news-making progress in this field. To cut the production time and costs of grinding small shafts, new Norton Type CTU Semiautomatic Cylindrical Grinders may now be equipped with automatic loading. Combining this new feature with automatic wheel guard type truing makes this machine fully automatic in operation.

Thus the fastest, most economical and versatile grinding machine of its type is stepped up to new heights of efficiency.

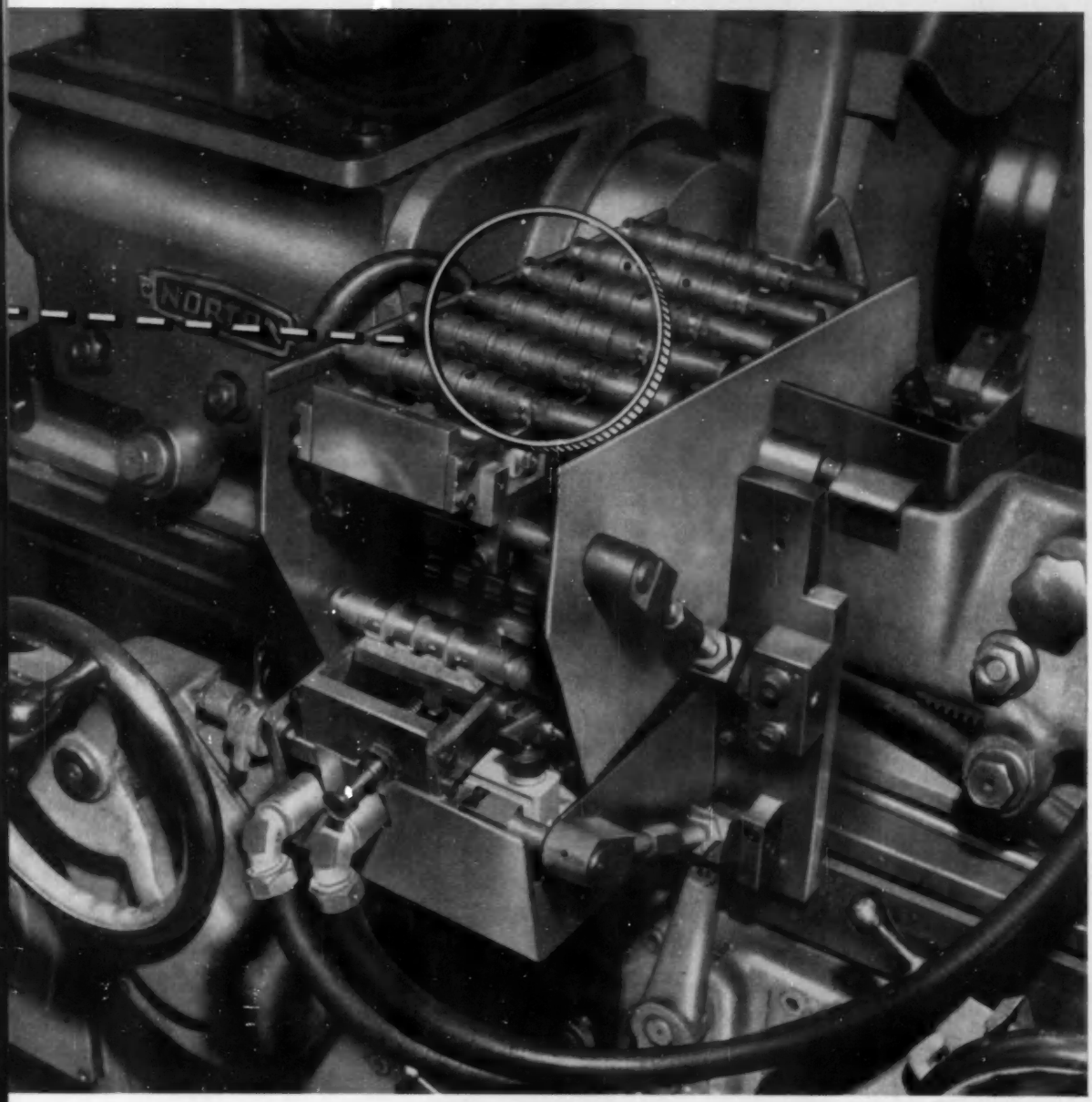
Why not see your Norton Representatives for complete facts on how these and many other advanced features of the Type CTU grinder can benefit your own production? Or write us direct. And remember: only Norton offers you such long experience in both grinding machines and wheels to bring you the "Touch of Gold" — to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.



LESS TIME, WORK AND SKILL ARE NEEDED with the Norton wheel guard truing device, a feature of many types of Norton grinders. Shown here on the 10" Type CTU, it functions completely automatically whenever truing is necessary. In so doing it increases production, wheel life and diamond life.



This 10" Type CTU Semiautomatic Cylindrical Grinding Machine, and the 6" size, are now available for automation with Norton-engineered automatic loading and wheel truing advancements.



ANOTHER NORTON MILESTONE IN AUTOMATION. This automatic loading device, latest Norton development for 6" and 10" Type CTU Semiautomatic Cylindrical Grinders, speeds the production and cuts the unit costs of grinding small shafts. Its steadily paced, automatic operation enables a single operator to tend a battery of machines.

The device is adaptable to a variety of these parts, which are rolled by gravity on inclined rails. Latches between the rails separate the shafts and are arranged to release only a single workpiece at a time to the turret, which is carried on a hydraulically controlled swinging arm.

When the workpiece rolls into the turret the arm swings the turret to locate the piece in line with the work centers. As these move forward they raise the workpiece just enough to clear the turret's supporting fingers and permit free rotation.

After grinding — electrically timed — the turret is swung upward. A latch indexes the turret so that the work rolls onto the unloading rails. The turret continues its upward motion to the loading position and receives the next workpiece.

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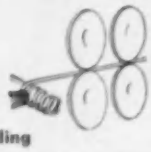
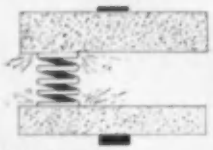
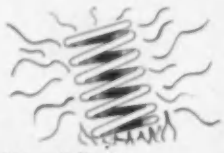


Coiling



Grinding



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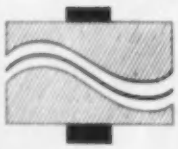

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for quality springs "Automatically" think of

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4058 West Thorndale Ave., Chicago 30, Ill.

PARIS AUTOMOBILE SHOW

(*Continued from page* 138)

a Ferlec automatic electro-magnetic clutch; and rubber padding at the bottom of the instrument panel, the top of the windshield and the use of plastic for all protruding parts. On the bigger Fregate the same safety measures are taken, and the four cylinder engine has been increased in size to 130.5 cu in. Extensive reorganization is being carried out by Renault, for it intends to add a new larger model in the spring with a rear engine of probably 50 to 54 cu in. This is being done to meet Volkswagen competition. The "750" is in production at 600 per day, and the Fregate model averages 158 per day. Under the reorganization, Renault heavy trucks are now linked up with Latil and Somua and increased attention will be paid to the production of a bus with the R.100 automatic transmission. This is the only completely automatic transmission produced in France and consists of a torque converter and two planetary gear trains.

Having absorbed the French Ford Co., Simca is now in an advanced stage of transformation. The original Simca factory is building passenger cars and light commercial vehicles with the same essential parts, while the ex-Ford works is building the V-8 Vedette with four distinct body styles. As the Simca group comprises the Unic truck company, the Ford Diesel trucks have been withdrawn. The Simca line features a new four-cylinder engine known as the Flash, which has a displacement of 79 cu in. It is made in two versions, the standard having a compression ratio of 6.7 to 1 and the other a ratio of 7.8 to 1. The higher powered engine is used on a coupe and a convertible.

Peugeot introduced a new model, the "403" a few months ago and consequently presented no changes at the show. Peugeot's production for this year will stand at about 125,000 passenger cars and light trucks, of which 27 per cent will be exports.

Panhard continues to specialize on an aircooled flat twin in a one-piece chassis-body assembly entirely of light alloy construction. Changes are a new flexible engine mounting, a new crankshaft with needle bearing connecting rods, new light alloy wheels and brake drums and a four speed synchromesh transmission with overdrive. Panhard has a working agreement with Citroen and is now as-

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Segmental bushings are made with slight bow.

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sembling the Citroen twin-cylinder aircooled delivery van.

Automatic clutches in France are becoming more popular for 1956 models. Renault and Panhard offer the Ferlec electro-magnetic clutch as optional equipment; Simca has its own electro-magnetic clutch as optional equipment; the small two-cylinder Citroen is fitted with a centrifugal clutch as standard equipment, and the Gravina centrifugal type has been taken up by Chenard & Walcker and is used an all Chausson buses. The Gravina comprises a conventional plate clutch, a centrifugal unit, a disconnecting mechanism and a fixed electro-magnet which is excited only during the short period of disengagement. With this exception, it is entirely mechanical. It has no longitudinal thrust on the crankshaft and by the built-in rachet mechanism it allows the engine to be used as a brake and permits push starts.

There has been no major trend towards plastic bodies. The Chausson Co., big producers of both steel and light alloy bodies, has a plastic department; but the bodies supplied at present are for small firms with limited production.

The Argentine appeared for the first time with a coupe entirely in plastic. This is powered by an aircooled V-8 engine of 3.15 by 2.96 in. bore and stroke (183 cu in.) having a compression ratio of 7 to 1 and stated to develop 115 hp at 4300 rpm. Cooling is by a fan driven off the crankshaft with the air being ducted from the front between the two banks of cylinders and discharged laterally. Four vertical dual Solex carburetors are used. The weight of the power plant, including clutch and three-speed transmission was given as 572 lb. Carrying no other name than the Argentine Industry, the coupe had American type styling, with steering column gearshift, grouped instruments under a cowl and built-in radio.

Pegaso, the State subsidized Spanish firm, showed a new model 2-3 seat coupe, known as the Z-103, to supplement the Z-102 which has been in production for three years. It uses a light-alloy V-8 engine with a stroke of 3.23 in. and a cylinder bore of either 3.43 in. (238 cu in.) or 3.66 in. (271 cu in.). Compression ratio is either 8 or 9 to 1. Each bank of cylinders has its own water pump and separate ignition system. The output of the large engine is 300 hp at 5800 rpm. The layout features a De Dion type rear axle with five-speed transmission and ZF self-locking differential.

While the Pegaso passenger car is obviously a limited production model, the truck division at Madrid has a program underway which shortly will produce 10 to 15 trucks per day and 30 Diesel engines. At the Paris show, the firm revealed a new truck with underfloor engine designed for a 12 ton payload. This six-cylinder engine, entirely in light alloy, is of the direct injection type with four valves per cylinder, a piston displacement of 610 cu in., and a power output of 165 hp at 2000 rpm. A feature of this chassis is a forward bogey with four wheels steering, the suspension being by superimposed inverted semi-elliptic springs, under bending only and relieved of all torsional stresses. The engine is centrally mounted under the frame members, with the radiator in front and the fan positively driven by flexible shaft off the front end of the crankshaft. A double reduction rear axle is used, giving eight forward speeds.

The second Pegaso chassis had a light alloy V-6 engine, with interchangeable heads for each bank of three cylinders, a four bearing

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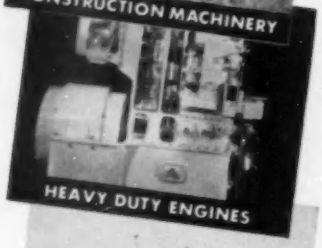
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SPECIAL PURPOSE VEHICLES

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nitrided crankshaft and pearlite cylinder liners. This chassis has independently-sprung front wheels with support arms, coil springs and hydraulic shock absorbers. Side rails are box section with tubular cross members, and a two-speed rear axle is used. Another version of this chassis has rear mounted engine for bus service.

An all-duralumin chassis frame was shown by Bernard. This followed the usual design of riveted channel section side rails and cross members with the side rails having a height of 18 in. to carry the two rear axles, one live and the other a load carrier, through them. Total weight is 58,240 lb, with a chassis weight, including electric brake, of 15,180 lb.

Saginaw Integral Power Steering Gear

(*Continued from page 73*)

compartment in the usual way. The flexible coupling transmits the rotation of the steering wheel to the screw without any loss of motion, but allows the slight axial motion of the screw for actuation of the valve without transmission of this motion to the wheel.

The ball-thrust bearing for the screw is assembled with a slight preload, and the helical ball-circuit itself is also slightly pre-loaded, by precision control of the ground threads and by selective assembly. Lash between the rack and sector teeth is removed by a simple external adjustment, as on previous Saginaw gears. Thus the gear is free from any play in its working parts. Other features of the gear worthy of mention are the use of die castings for covers and for one internal part, and the use of specially designed seals using combinations of Teflon and synthetic rubber.

The gear as a package is unusually compact, and appears not much larger than an equivalent manual steering gear. It weighs much less than the previous gear, the difference in some cases approaching 20 lb.

It is said that it is impossible to detect the point at which hydraulic boost comes in to assist the driver in handling steering loads of any consequence. Parking is extremely easy, with efforts even lower than with the former gear.

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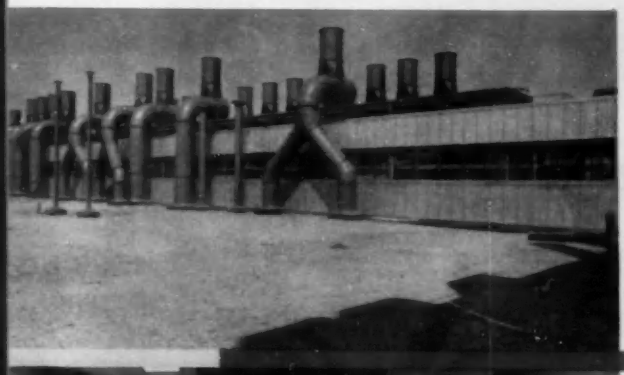
Paint Processing Equipment by Peters-Dalton
–part of the CHRYSLER *Forward* Look

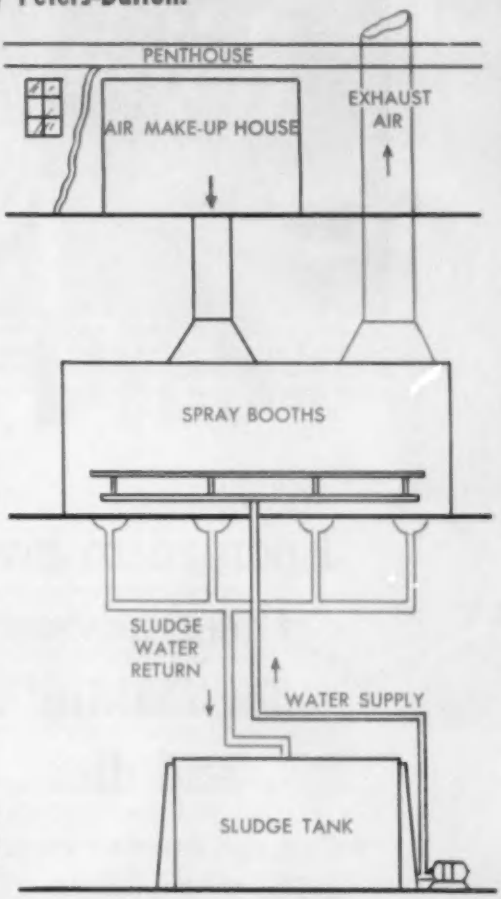


Roof level includes exhaust fans and ducts along with fresh air make-up house.

Second floor level contains paint finishing production lines and spray booths.

First floor level contains fresh water pumping system and sludge tanks for paint separation.

Multi-million dollar expansion program at Chrysler-Jefferson Plant, Detroit, includes the installation of special high production paint process equipment—designed, engineered, fabricated and erected by Peters-Dalton.



To fill an important role in the huge expansion program undertaken at the Chrysler-Detroit Plant, the requirements for a vast paint processing equipment installation were met by Peters-Dalton. This is another case of an outstanding challenge solved by P-D engineers. The equipment had to be designed to fit within the structure being built by Chrysler and to conform to layouts made by their plant engineers. It operates on three levels and provides the special services so necessary for maintaining its part in the highly accelerated production program at Chrysler.

Whether your needs are for an installation comparable to this or for one of a basically simple nature, depend on the more than quarter century of Peters-Dalton engineering experience. Find out for yourself —just write, wire or phone.

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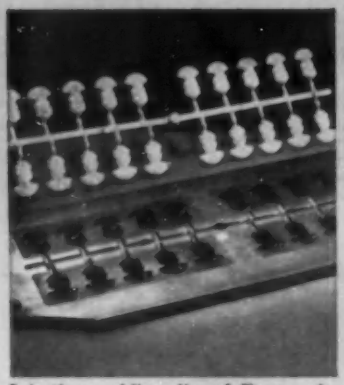
How much money can



Injection molding dies of Epon resin (left) reduce costs 80% for Adams Plastic Products, Cincinnati, Ohio. Duplicate patterns (center) are made to close

tolerances with Epon resin by Crane Company, Chicago, Ill. Epon resin dies for outboard motor housing (right) are one-third cost of comparable metal dies

for Clinton Machine Company, Maquoketa, Ia. Formulations for these three applications supplied by Kish Industries, Inc., Lansing, Mich.

Epon resin gives you these advantages for making tools and dies . . .

- Cast and cured at room temperature . . . no special equipment needed
- Cast to close tolerances . . . less machining and handwork
- Easily duplicated and altered . . . short production time

Epon resins are the epoxy polymers made exclusively by Shell Chemical Corporation.

Epon resin stretch dies developed and used by Lockheed Aircraft Corporation, Burbank, California, show high dimensional stability and strength.

Toy models of Epon resin made by Ber-Design Associates, Irvington, N. J., stand up in duplicating machine during hob-making process at Columbia Engineering Company, Newark, N. J.

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to make TOOLS and DIES?

New resin can reduce tool production costs by 80%

PLASTIC TOOLING now has graduated from the short-run experimental stage to the profitable production stage . . . thanks to the unusual physical properties of Epon resin.

Saves time and labor

Little machining and handwork are required to finish Epon resin tools, dies, and patterns, because the material can be cast to very close tolerances. No specialized equipment is needed, because Epon resin tools are cured at room temperature.

Tools resist wear

Other advantages of Epon resin tools are that they withstand great pressures, are unaffected by chemicals and a wide range of temperatures, and maintain a high resistance to abrasion and corrosion.

Where Epon resin tools are used

Draw dies, drop-hammer dies, and injection molding dies for polystyrene . . . are some of the Epon resin tools now serving a variety of industries. Drilling, welding, routing and checking fixtures, foundry patterns, and vacuum-molding dies . . . all made of Epon resin, are also in daily production.

Find out more

Savings of 80% over the cost of comparable metal tools have been reported by tool- and die-makers. How much can you save in your operations? Best way to find out—write for technical literature on the use of Epon resin in tool and die applications.

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Higher Output Engines Feature

LONDON MOTOR SHOW

(*Continued from page* 56)

"evolution not revolution" was the British way. It is true, of course, that many British cars have been conceived primarily for the roads, tastes and driving habits of the U.K. For example, short-run, stop-and-go driving in low-powered cars makes acceleration and top-gear flexibility more important than high sustained speeds with minimum engine wear.

So far there has been no attempt to emulate Continental European departures from established designs, although in many back rooms development work is going ahead on hydraulic suspensions, disk brakes, gas turbines and plastic bodies. But more attention is being given to combining the requirements of overseas motorists with the sound engineering practices of the British industry. One instance is the inclusion this year of overdrive as standard or optional equipment on several dozen models. Similarly, square, short-stroke engines with lower piston speeds are gaining ground.

More automatic transmissions are available. Emphasis on performance is shown by the increasing number of 100 hp family cars on the market. The range of all-purpose station wagons has been extended. There is also wider use of unitary body-frame construction. Many manufacturers have improved their body styling, paintwork, interior finish, and attention to detail and safety features. These are all trends which stood out at the London show.

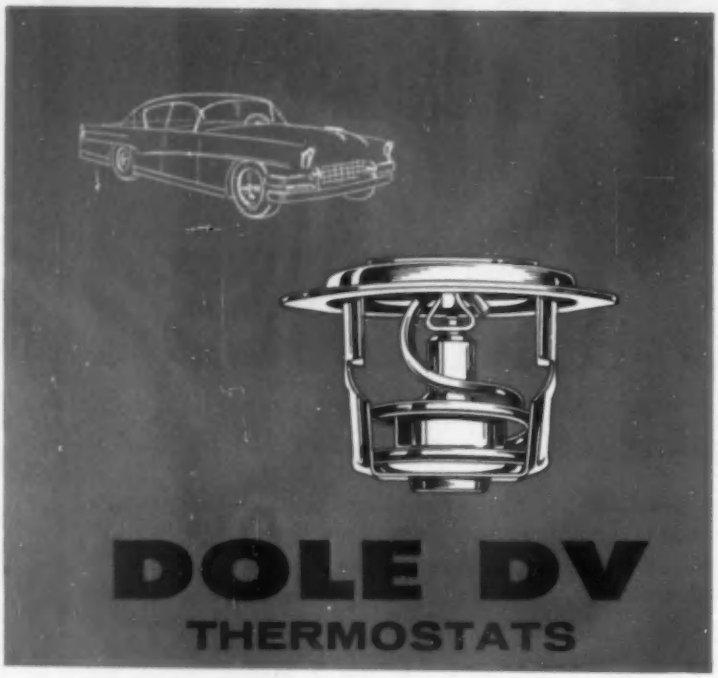
Thirty British firms exhibited a total of 187 cars at the largest exhibition ever staged by the Society of Motor Manufacturers and Traders. In addition there were 100 models from six overseas countries, including 17 makes from the U. S. and Canada. Altogether 537 stands occupied a display area of over ¼ million sq ft.

Jaguar's small four-door of 2.4 liters (151.5 cu in.) made its debut at London. It was originally scheduled to appear at the Paris show earlier in the month, but was withdrawn because Jaguar considered the stand allocation inadequate. The six cylinder engine is basically the same as the XK unit but with stroke shortened to 3.01 in. Bore remains at 3.26 in., giving oversquare design. The twin ohc engine with 8 to 1 compression ratio develops 112 hp at 5750 rpm. Peak piston speed is 2880 fpm.

Integral body-frame construction is used for the first time in a Jaguar. Extensive use of rubber insulates the body from road noises. Rear suspension is by cantilever semi-elliptic springs which extend the wheelbase while concentrating stresses in the area of greatest strength. Low build and weight reduction to 2800 lb are claimed to give an easy 100 mph performance.

Rootes has made a further break from traditional British styling with the Sunbeam Rapier. This luxury two-door hardtop embodies a number of mechanical features of the Hillman Minx and Californian. The same basic 85 cu in. ohv engine is used, but power is boosted to 62 hp at 5000 rpm. This is done by fitting a Stromberg carburetor, raising compression ratio to 8 to 1, and improving breathing.

(*Turn to page* 155, *please*)



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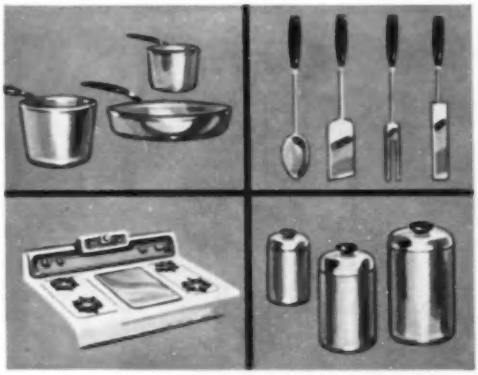

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Steel plate, during heat treatment and quenching, twists and warps like a piece of shoe leather left out in the rain. The similarity ends there, because the fifty ton sections of plate—armor up to 8" thick or carbon steel up to 15" thick—require enormous pressure to straighten them out.

*Clearing Productivity Consultants, working with Lukens Steel Company engineers, developed the 5,000 ton hydraulic press shown here to put the straightening process on a more productive basis. The giant machine has a flexibility of operation and simplicity of control usually associated with only the smallest units of its kind. A unique feature is the movable press ram which, in conjunction with motorized cars, makes all areas of the plate easily accessible for straightening. The cars and ram are operated from the pulpit-like control.

Few people have a problem like this particular one, but all companies are constantly faced with the critical problem of increasing productivity. If you're looking for a more efficient way to do a job with power presses, call in one of Clearing's specialists. There'll be no obligation.

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...keep brake maintenance costs low because they are so dependable."

says: R. J. CUMMINS, Maintenance Control Supervisor, Foster Freight Lines, Inc., Indianapolis, Ind.

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Gentlemen:

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Approximately 90% of our present power units are equipped with Wagner Air Brakes. In the years we've been using the Wagner Rotary Air Compressor, many of them have operated efficiently for unusually long periods of time without failure or need for repair. Wagner Air Brakes are quiet in operation, have fast air pressure recovery and keep brake maintenance costs low because they are so dependable.

We definitely plan to continue to order Wagner Air Brakes as original equipment.

Very truly yours,

R. J. Cummins
Maintenance Control Supervisor

Meeting 'on-the-road' schedules, assuring maximum cargo and equipment safety and keeping maintenance costs at a minimum are major responsibilities for all fleet operators. You can see from Mr. Cummins' letter how his company's operation benefits from the dependability of WAGNER AIR BRAKES.

Actual checks with fleet operators have clearly shown that many units equipped with WAGNER AIR BRAKE SYSTEMS never have compressor failure or require compressor exchange—even after *years* of service. This high performance record is largely due to the superiority of the WAGNER ROTARY AIR COMPRESSOR. It is the *only* compressor utilizing *rotary motion* to keep friction loss low and operating efficiency high. Because of its fast air recovery, users are assured an adequate supply of air pressure at all times. This feature alone guarantees safe, sure stopping power to meet any road emergency.

WAGNER ROTARY AIR COMPRESSORS eliminate carbon formation in air lines and reduce fire hazard. Uniform torque load provides smooth, quiet operation with moderate stresses. Parts are interchangeable and only a minimum of preventive maintenance is required.

Because of the ever-increasing demand for greater road and cargo safety and maintenance economy, it will pay you to include Wagner Air Brakes as standard equipment on the vehicles you manufacture.

Send for your free copy of Wagner Bulletin KU-201 for full information and complete details. It will be sent to you without cost or obligation. Mail your request, today.

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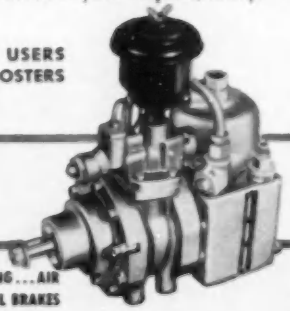

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LONDON MOTOR SHOW

(*Continued from page* 150)

The four-speed gearbox is also the same, but overdrive operating in third and top is standard equipment.

Front suspension on the Rapier is of new design, with a ball joint on the upper support arm and a swivel pin and trunnion on the longer bottom one. Body and frame are in one unit, with the floor recessed well below the side members to give greater leg room.

Standard has put an entirely new body on its 5/6-seater Vanguard to make the Phase III with longer wheelbase and lower build. Integral construction has effected a weight saving of 140 lb. With better breathing the established 127.6 cu in. engine now delivers 68 hp at 4200 rpm. The greater power and lighter weight have made it possible to raise the top gear ratio with consequent increase in maximum speed and running economy. Overdrive is offered as an optional extra.

Makers of higher priced specialist cars have turned out a number of new or improved models. Armstrong-Siddeley unveiled two small Sapphires designated as 234 and 236. Both have similar four-door bodies and channel-section frames, the main difference being the engines. The lower-powered 236 has a six cylinder unit rated at 85 hp at 4500 rpm. Bore and stroke are 2.75 in. and 3.94 in. with 140.9 cu in. displacement and 7.5 to 1 compression ratio.

A four cylinder engine of about the same volume (139.7 cu in.) powers the 234. This is 3.54 in. square, and develops 120 hp at 5000 rpm. It is based on the larger six cylinder Sapphire 346 unit, and high output is obtained by using twin S.U. inclined carburetors together with two inlet and exhaust manifolds.

Of special interest is the inclusion in the 234 of the Manumatic transmission with the four-speed gearbox and optional overdrive. Made by Automotive Products, it is a vacuum-operated mechanism to permit clutchless driving. The three main components are a centrifugal clutch, its operating servo, and a control unit. When the gear lever is gripped in anticipation of a shift, an electric switch within the knob energizes the control solenoid, which in turn applies vacuum to the clutch servo to disengage the drive.

The system also establishes the cor-

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rect engine speed for a gear change. This is done by two independent vacuum throttle servos. One of them, in circuit with the clutch servo, closes the throttle at the start of a gear change. The other is connected to a synchronizing switch which is arranged to close an electrical circuit if engine revolutions fall below driven plate speed during disengagement. This operates the throttle-opening servo, overriding the throttle-closing servo to raise engine speed appropriately.

Singer introduced an improved engine for its Hunter four-door. A new cylinder head with twin ohc is fitted to the existing four cylinder block of 91.3 cu in. Compression ratio is raised to 8 to 1, and the crankshaft is forged from stronger steel to handle the greater power. Output is increased by 56 per cent to give a maximum of 75 hp at 5250 rpm. Exhaust and inlet valves form a 90 deg Y, and camshaft sprockets are chain driven from an intermediate sprocket which is linked by chain to the crankshaft. Two Solex carburetors are centrally mounted over the inlet valves. A four-branch manifold carries the exhaust.

The 60 hp Lanchester Sprite, with a number of body and chassis changes, continues as Britain's only medium-powered car equipped with a fully-automatic transmission. This is the Hobbs unit (described in A.I., July 1, 1954), whose main features are absence of mechanical loss and a manual overriding gear selector. In August Daimler announced that it had purchased the patents and controlling interest of Hobbs, and would undertake manufacture of the transmission.

At the show, Daimler presented the One-O-Four chassis with several body variations to supersede the Regency models. Output of the 211.5 cu in. six-cylinder engine has been raised to 137 hp at 4400 rpm, mainly by a redesigned aluminum cylinder head and the use of new diaphragm-type S.U. carburetors and a quick-lift camshaft. Transmission system includes fluid drive with preselector control. The D.K. 400 limousine, with an eight-passenger Hooper body, has been added to the Daimler range. Wheelbase is 130 in., and the 281 cu in. engine drives through a fluid transmission and four-speed epicyclic gearbox.

Another big car, the Austin Princess, has appeared with an automatic transmission. This is a British-built version of the Hydra-Matic, which is also used by Rolls-Royce, Bentley and Armstrong-Siddeley.

Several sports cars were displayed at Earls Court in new trimmings. One of these was the Aston Martin DB2-4 Mark II hardtop. Special features include a strengthened rear axle, and interior air conditioning supplied by a scoop on the cowling. The Triumph TR3 has an occasional seat large enough for two children. Power is increased from 90 to approximately 100 hp, and the chassis is strengthened to handle the additional performance.

Austin Healey produced the 100M, whose engine is up-rated from 90 to 110 hp. This is done with Le Mans modifications which cover improved induction, larger S.U. carburetors, high-compression pistons, and a high-lift camshaft. It has a new four-speed close-ratio gearbox with manually-controlled overdrive in third and top, and enlarged brakes.

Among the new crop of station wagons were two small Fords, the Escort and Squire, based on the highly successful Anglia and Prefect launched at the 1953 London show. The rear seat folds flat, giving a clear cargo area of 47 cu ft. Easy access is given by the horizontally-split tail gate, which opens exceptionally

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for that vital spot *where power takes hold of the load*

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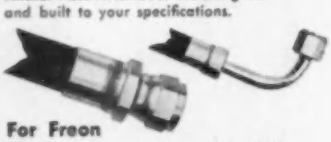

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wide to avoid bumping head and knees.

A distinguishing feature of the Humber Hawk model is the one-piece loading door which is said to eliminate rattles. The window winds down into the gate with an external crank, exposing the inside release catches on each upper corner. The crank can be locked in any position, leaving the window partly open to provide through ventilation when desired. Allard came out with its Safari wagon whose optional power units are a Cadillac or Lincoln V-8 as well as a six cylinder Jaguar engine.

In the components section emphasis was given this year to transmissions and brakes. Borg-Warner overdrives are already being made under license by Ford and B.M.C., and a number of these were on show. Comparable units built by Laycock are available on 30 British cars. Lockheed exhibited the latest version of its disk brakes which are now suitable for cars weighing over 3360 lb. It also displayed the new Lockheed hydraulic Brakemaster system, which uses a single expander cylinder with differential arta pistons on each wheel. Forces in a constant ratio are applied to leading and trailing shoes. It is claimed that stable braking is possible under all conditions with equal wear on both linings, while the installation is simpler than the two-leading shoe design. The system includes a vacuum booster, and is employed on the 2.4-liter Jaguar.

Girling has developed its disk brakes to the stage where production for private cars is anticipated. Improvements over earlier versions include the replacement of circular friction pads by thicker segmental ones bonded to the pressure plates, and the use of two actuating cylinders, one on each side of the caliper. Rear wheel assemblies incorporate additional pads for the hand brake.

In addition to the Manumatic transmission seen on the Armstrong-Siddeley, Automotive Products showed its latest power steering intended for linkages having a three-piece track rod. The same firm exhibited examples of Thompson self-aligning front suspension joints.

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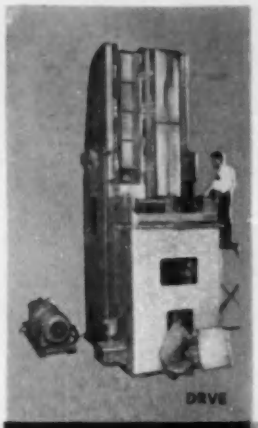

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created the *greatest interest*
in Chicago, at the **MACHINE TOOL SHOW**
. . . if you were there, you know
it was the **5** electro-motive drive
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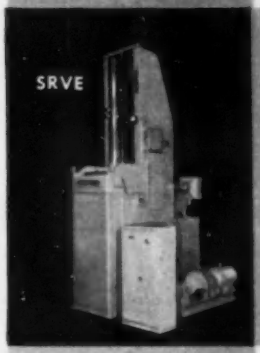
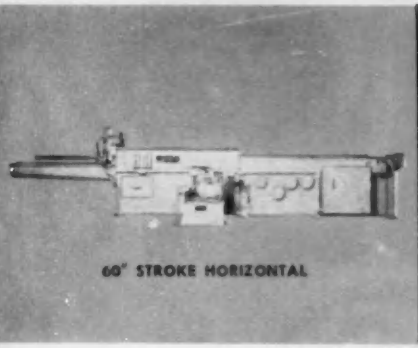
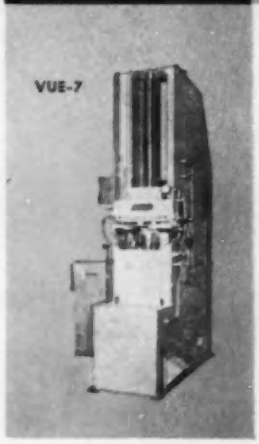






The 3 vertical machines and the 2 horizontal machines developed by LAPOINTE with electro-motive drive embody the world's greatest advances in the history of broaching. These machines, in fact, can represent *the most productive floor space in your plant!*

Just why is everyone — especially automotive — turning to the *electro-motive drive* for broaching?

1. **Amazing increases in production**
   Broaching speeds up to 300 feet-per-minute (and more) have scrapped all previous concepts of production output!
2. **Elimination of chatter**
   Smooth, powerful drive through a mechanical bull gear rack eliminates all chatter and substantially improves quality of work.
3. **Permits carbide tooling**
   The high speeds and smooth operation make carbide tooling completely practical.
4. **Prolonged tool life**
   Increases of 400% to 500% in tool life, between grinds, reduce downtime and show real dollar savings in tools.

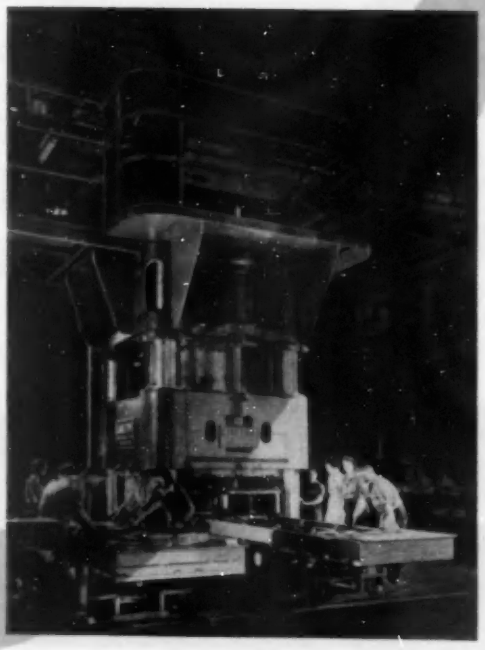
Send for descriptive literature on all 5 LAPOINTE ELECTRO-MOTIVE DRIVE Broaching Machines.

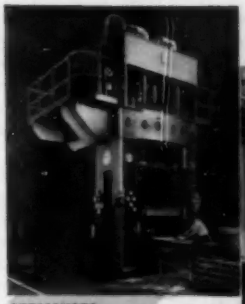
THE **LAPOINTE** MACHINE TOOL COMPANY
HUDSON, MASSACHUSETTS • U. S. A.
Subsidiary: Worthington Corporation

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

FROM BATHTUBS

TO AIRCRAFT PARTS...



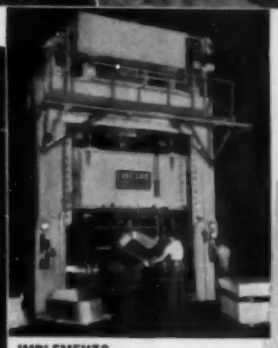


APPLIANCES

ORDNANCE

FARM MACHINERY

AUTOMOTIVE PARTS



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"Everything" is a broad term...but suppose you be the judge as to whether your production could be *hydraulically-pressed* to advantage. Pressing metal into a desired shape reduces or completely eliminates costly machining and scrap. For help in reaching a decision regarding this newer method of production, use our competent engineering assistance freely.

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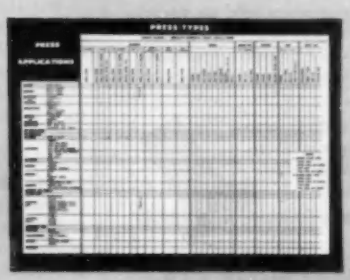

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LAKE ERIE®

NMTBA MEETING
Forsees High Machine Tool Sales

(*Continued from page 74*)

industry to do everything within its power to expose the old fallacy.

1960 Show

Tel Berna, new Executive Vice President of the NMTBA, discussed the rules for eligibility in the 1960 Machine Tool Show to be held again in Chicago. He explained that in order for a company to be eligible, it will not exhibit its machine in an unsanctioned exhibit, nor will it permit its distributor to do so, nor lend its machine to another for that purpose from now until the 1960 show. This rule applies to the display of a model, photograph, subassemblies, or parts. Exceptions to this basic policy, of course, would be for a builder to show machines in its own plant, district office, or distributor show room. There are a few other exceptions which may be sanctioned by the board governing the show. None of the rules, however, apply to exhibitions outside of the U. S., and none of them apply to the display of equipment that is not classified as a machine tool, according to the Association's definition. The show board has already entered into a contract for the International Amphitheater for 1960 and has reserved all possible hotel rooms in Chicago for that period.

LOWER THE BOOM ON COSTS
SET RIVETS FAST
2 at a time with the
Chicago "214"

With every press on foot pedal Model 214 Chicago Double Rivet Setter automatically feeds, inserts and clinches *two* rivets. 14-inch throat accommodates large assemblies. Handles 9/64" diameter or smaller steel tubular rivets—lengths to 7/8". Quick Change Rotary Type Hoppers and Raceways permit a 5-minute changeover to rivets of different size. Adjustable anvils and riveting centers add to versatility. For help with fastening problem...send sample assembly (or a blue print) for free fastening analysis.

FREE CATALOG contains valuable engineering information and rivet specifications plus illustrated descriptions of 26 Chicago Automatic Rivet Setters.

Chicago Rivet & MACHINE CO.
9612 West Jackson Boulevard, Bellwood (Chicago Suburb) Illinois
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The Strange ILO

The U. S. should withdraw from the International Labor Organization unless steps are taken to prevent it from becoming dominated by the Communists, W. L. McGrath, president, Williamson Heater Co., Cincinnati, and U. S. Employer Delegate to the ILO, told members of the NMTBA.

"The Communists have their foot in the door of the ILO," McGrath said, "and they are preparing to take it over." In 1954, he explained, Russia, which had long been absent from the ILO, came back in as three countries —the U.S.S.R., the Ukraine, and Byelorussia. They are supported in the ILO by Poland, Bulgaria, Hungary, Czechoslovakia and Albania, making a communist bloc of eight nations.

Even before the Russian re-entry, he said, the ILO was controlled by a socialist government - labor coalition. Both communism and socialism are collectivist systems and go down the same line on matters of basic principles. Furthermore, many nations are impressed by, and afraid of, the Russians. ILO proposals and findings will go more definitely to the left. It is going to be swamped by Red propaganda.

The ILO is tripartite, each country sending delegates representing government, workers, and employers.

"The employer delegates to the ILO," McGrath said, "contended that the communist so-called employer delegates could not possibly represent free associations of free employers because there were no such associations in communist countries. Our claim was that they were simply government agents, and agents for the Communist party.

"At the 1954 Conference we made a determined effort to get these communist so-called employer delegates thrown out. We were defeated. At the 1955 Conference we tried to keep them off our employer committees, and once more we were defeated. We

NEW *Totally Protected* MOTORS NOW AVAILABLE

Complete line of the NEW Reliance Totally-Protected A-c. Motors is IMMEDIATELY available.

These star performers combine maximum physical strength and protective enclosure. Starting and full load torques in excess of NEMA standards . . . built-in reserves to meet *extra* production loads.

Mount the new compact NEMA Frames where ever you have an application for an a-c. motor of 1 to 40 horsepower. All types of mountings . . . frame sizes 182 to 326-S.

Reliance Motors are *totally protected from core to cover* . . . rotating components and active material are carefully treated and assembled to assure a lifetime of trouble-free continuous performance.

Let us put these star performers to work for you—write for complete information. B-1508

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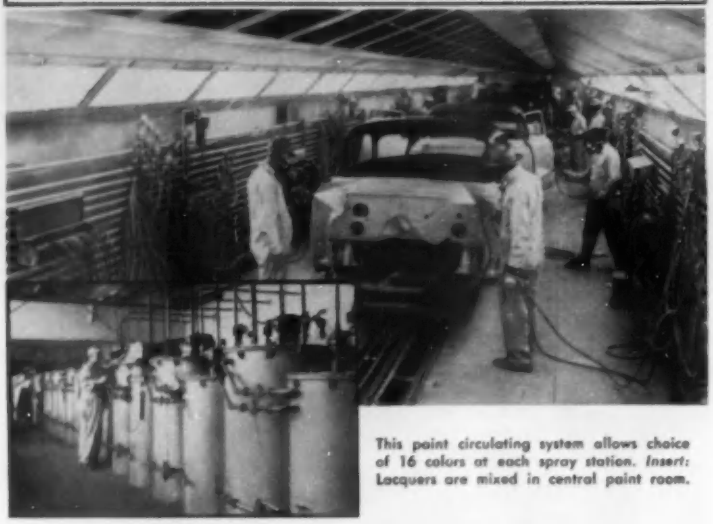
WHAT'S NEW in paint circulating systems



This paint circulating system allows choice of 16 colors at each spray station. *Insert:* Lacquers are mixed in central paint room.

Automatic paint circulating system guarantees Packard body parts will match

Here's how a closed-type Binks Paint Circulating System insures Packard's quality control

The lacquer sprayed by every paint spray gun in Packard's new Conner Avenue Plant in Detroit comes from a central source. This insures that parts painted in one end of the plant will perfectly match those finished in another section.

Paint for all operations is prepared under laboratory control in a fireproof paint mixing room which houses 22 dual tanks (each consisting of a separate mixing tank and supply tank), and 11 single units which combine a mixing and supply tank. Paint is mixed and maintained at 77° F. Color and viscosity are precisely controlled.

16 colors are piped from the tanks to all spray stations. In a matter of seconds, any sprayer can connect his gun to the line carrying the desired color. Uniform and measured paint delivery to each gun is assured by the use of Binks PM-103 Regulators. Atomizing air pressure is closely controlled by Binks AO-120 Oil and Water Extractors at each station.

The Packard paint circulating system allows 52 possible color combinations and is set up to apply 4 coats of lacquer in 2 or 3 tones. More than 400,000 gallons of lacquer are used each year.

Packard's choice of a Binks paint circulating system and Binks equipment is another example of how that company maintains "Complete Coordinated Cooperation" in all production.

If your production setup has 2 or more spray stations using in excess of 50 gallons of paint each day, it will pay you to investigate this type of installation. The more paint you use, the greater your savings. To learn of the many other advantages of a Binks Paint Circulating System, see your jobber or distributor, or write directly to:

Binks

EVERYTHING FOR SPRAY PAINTING

GUNS COMPRESSORS FLUID TANKS FREE INSTRUCTION

BINKS MANUFACTURING COMPANY

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wound up by having communist agents on the employer groups of the ILO.

"There is one last stand still to be taken. The ILO has appointed a committee to determine whether employer and worker delegates from various countries represent associations of *free* employers and *free* workers, or whether they don't. This might be the basis for a constitutional amendment under which so-called communist employer and worker delegates could be thrown out. This committee is supposed to make its report at the November meeting of the Governing Body.

"If the Governing Body takes this proposal seriously and puts the matter on the agenda of the ILO Conference, I think that we in the U. S. should stick tight and use our utmost influence to further this objective.

"But if no determined effort is made by the ILO to disqualify the communist so-called employer and worker delegates, we will be faced with the prospect that the ILO will become just another communist-dominated organization. And in that case I can see no further constructive purpose to be gained by continuing further U. S. participation in the ILO."

McGrath pointed out that the eight Iron Curtain countries in the ILO have a total of 32 votes, as compared to four votes for the U. S. Meanwhile, the U. S. pays 25 per cent of the cost, while the eight communist countries pay a total of 14½ per cent."

Foreign Trade

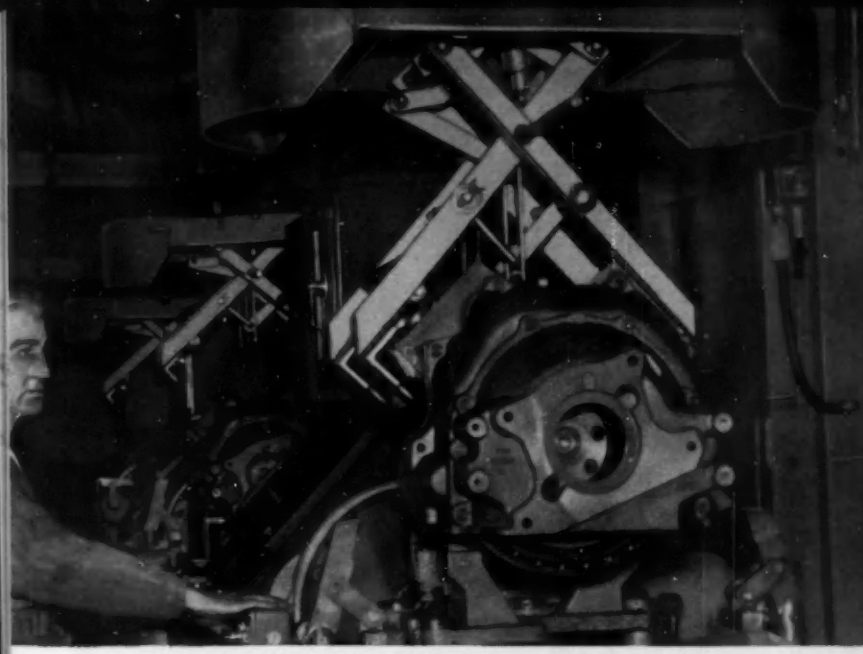
The "apparent lack of reciprocity" in reciprocal trade agreements with respect to machine tools was emphasized by Everett M. Hicks, vice president and general manager, Grinding Machine Div., The Norton Co., Worcester, Mass., who is chairman of the Government Relations Committee of the NMTBA.

"Several years ago," Hicks said, "the U. S. machine tool tariff was cut in half from 30 per cent to 15 per cent. We have not been able to perceive that any similar actions have been taken by foreign governments on the products we sell.

"Even more important than this are the quotas and other artificial restrictions which are imposed by many foreign governments. England, for example, bars the importation of any machine tool of a class or kind which is made in England.

"Some time ago the French government relaxed its rigid restrictions on the import of machine tools, ex-

(*Turn to page* 168, *please*)



Over 100 pairs of Heppenstall Safe-T-Tongs are carried by a modern power-and-free conveyor on a prominent automobile producer's assembly line. They pick up partially assembled engine blocks and deliver them to machines which drill their crankshaft area. Next, the tongs lift the blocks and transport them to the following operation.

Heppenstall automatic Safe-T-Tongs, custom built to your individual needs, speed handling, eliminate safety hazards

Heppenstall's fully-automatic Safe-T-Tongs are today's answer to many difficult material handling problems encountered in "automated" production set-ups. Requiring no power, they operate merely by being lowered on the burden to be lifted. They go through their entire cycle of automatic operation quickly, safely, accurately and efficiently.

Safe-T-Tongs are also widely used in the automotive industry where individual lifts of materials are handled by hoist or crane. They do not require any rigging or chains on the load to be lifted, nor ground chainmen — thus eliminating potential safety hazards. Your craneman does the entire job, either from his cab or by remote control.

Whatever your particular handling jobs require — regardless of shapes, weights or sizes — Heppenstall tongs, engineered specially to your individual needs, will help you economically speed materials handling operations with greater efficiency and safety.

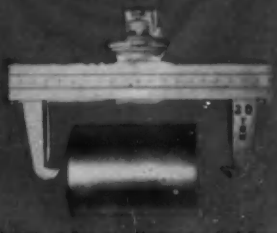
For complete information and technical assistance contact Heppenstall Company, New Brighton, Pa. Sales offices and representatives are located in principal industrial centers.

Heppenstall

. . . tongs for every automotive lifting problem

Coil Handling "C" Hook

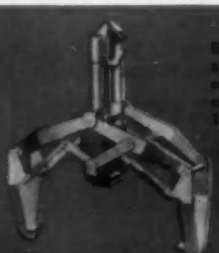
Single "C" Hook



Motorized Rotating Horizontal Coil Tong

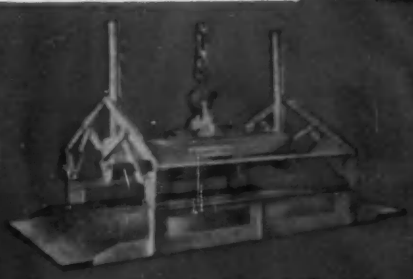
Single Vertical Coil Tong

Motorized Rotating Crane Hook



Motorized Horizontal Coil Tong

Rack and Pinion Horizontal Coil Tong capable of handling coil widths from 19½ to 32 inches



Motorized and Manually Operated Sheet Lifters

Forecast for 1955 Motor Vehicle Registrations

(*Continued from page* 75)

These substantial gains in registrations reflect the exceedingly high production schedules of the various vehicle manufacturers throughout the year and the resulting high rate of domestic sales to consumers.

California will be the leading state with a total of 6,040,000 registered vehicles, followed by New York with 4,560,000 and Texas with 3,832,000. Pennsylvania will be in fourth place with a total of 3,790,000. Ohio, Illinois, Michigan, New Jersey, Indiana and Florida will be in fifth to tenth place in the order named. These 10 states will have combined registrations of 33,158,000 or 54 per cent of those in the entire country.

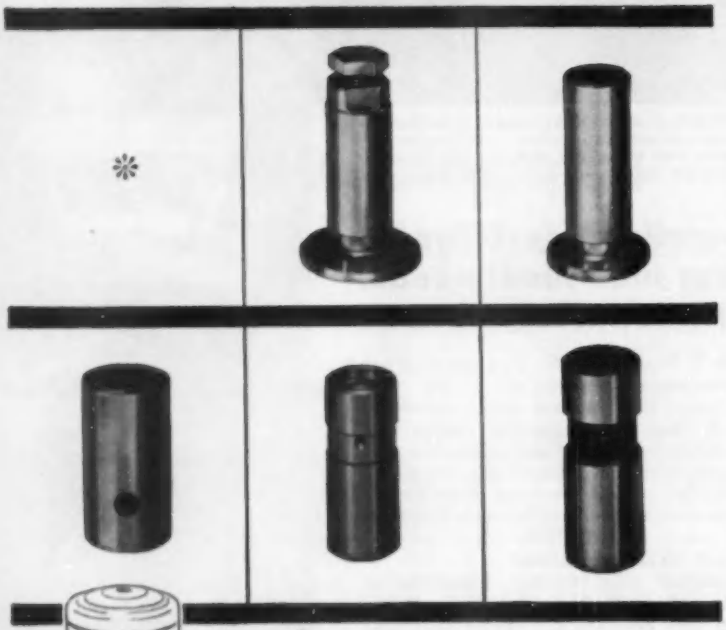
Regionally, the Pacific Coast states will show the greatest percentage increase with an anticipated 7.50 per cent over 1954. Following closely is the West South Central region with a 7.3 per cent gain. The South Atlantic and the East South Central regions will be about on a par with percentage increases of 6.6 and 6.7 respectively. The New England States appear to have the least gain percentage wise, though their increase of 4 per cent in 1955 over 1954 can be considered as quite substantial.

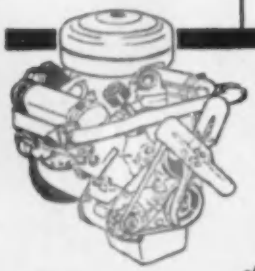
These interesting facts pertaining to our 1955 estimated motor vehicle registrations result from the annual survey conducted by AUTOMOTIVE INDUSTRIES in conjunction with the motor vehicle commissioners of the various states. All of the states cooperated in furnishing actual data to the nearest and available data plus their estimate for their registration year. It is believed that this forecast will be within one per cent of the final data which will be published in the 1956 Statistical Issue of AUTOMOTIVE INDUSTRIES, March 15, 1956.

MOTOR VEHICLE REGISTRATIONS BY REGIONS

Region	1955	1954	% Gain
New England	3,358,000	3,227,725	4.04
Middle Atlantic	10,250,000	9,835,418	4.21
South Atlantic	7,828,000	7,340,345	6.64
East North Central	12,858,000	12,219,365	5.23
East South Central	3,712,000	3,478,073	6.72
West North Central	6,316,000	6,062,174	4.19
West South Central	6,314,000	5,886,343	7.26
Mountain	2,688,000	2,543,296	5.69
Pacific	7,985,000	7,427,631	7.50
Total	61,309,000	58,020,370	5.67

JOHNSON *tappets*





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Continual experimentation and excellent manufacturing methods show a steady product improvement that make JOHNSON TAPPETS worthy of your consideration. Only proven materials, covering a range of steel, chilled iron, and various iron alloys are used in the manufacture of JOHNSON TAPPETS, providing greater strength, light weight and increased wear resistance. Serving the AUTOMOTIVE — AIRCRAFT — FARM — INDUSTRIAL — MARINE Industries.

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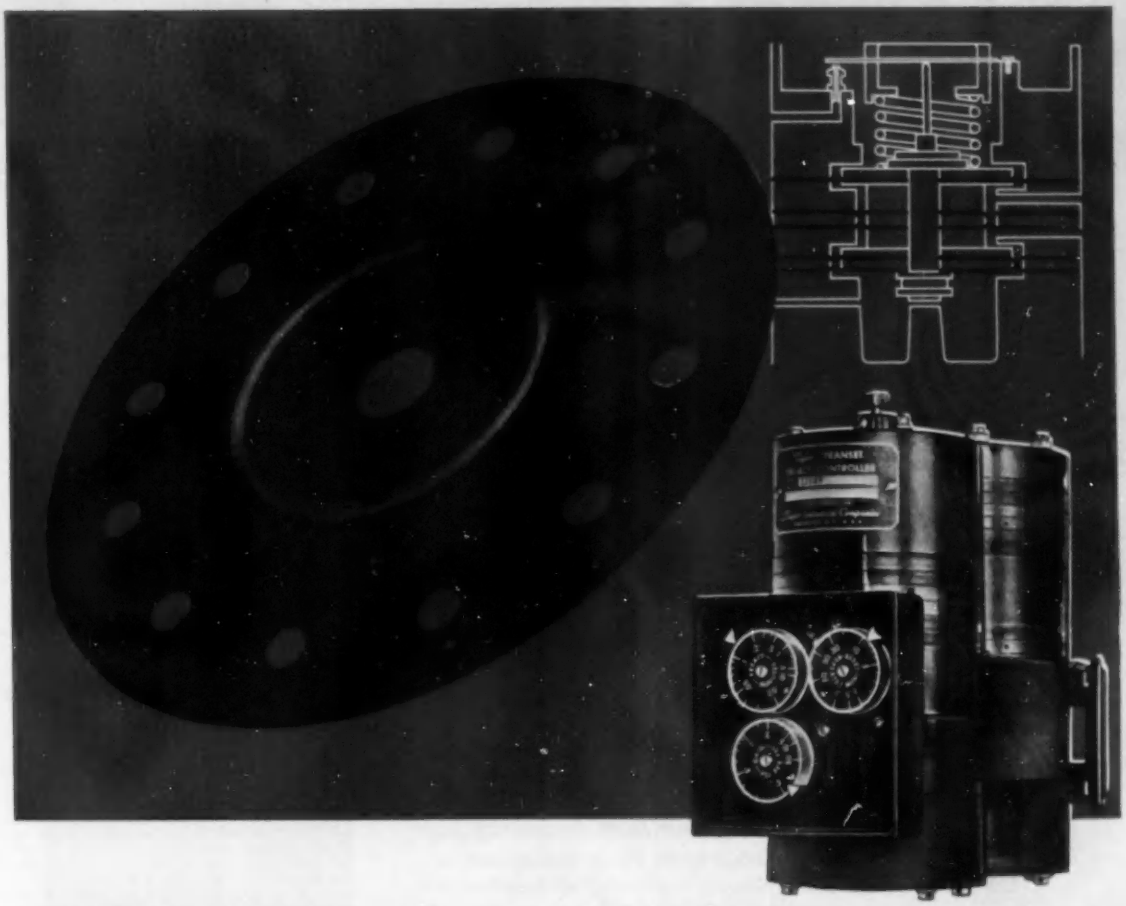

WHERE PRECISION PREDOMINATES

TAYLOR INSTRUMENT INSISTS ON SIRVENE

It looks simple . . . but the performance of a remarkable instrument depends greatly on the precision of this Sirvene (synthetic rubber) diaphragm. Chicago Rawhide makes it for the Taylor Tri-Act Controller, a pneumatic, force-balanced instrument that gives faster, closer and simpler control of virtually any complex process in industry. Any variance in the exact concentricity of the diaphragm would make it extremely difficult to balance out the instrument. Chicago Rawhide's Sirvene Division consistently delivers this exact concentricity and dependability to Taylor Instrument. They can do the same for you.

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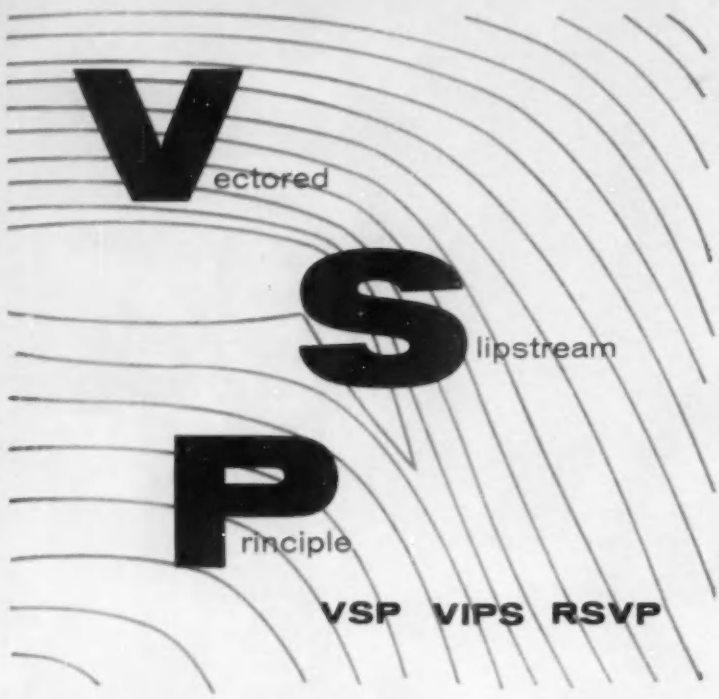
Other **C/R** *products*

OIL SEALS: Shaft and end face seals for all types of lubricant retention and dirt exclusion • CONPOR: Controlled porosity mechanical leather packings and other sealing products • SIRVIS: Mechanical leather boots, gaskets, packings and related products.



Advanced research at Fairchild in the applications and effects of the Vectored Slipstream Principle has brought about the need for qualified aerodynamicists who have worked in this vital field, and who can make valuable contributions to its development.

Fairchild, producers of the famous C-119 *Flying Boxcar* and C-123 *Provider*, are now preparing transports, advance reconnaisance aircraft, fighters and missiles. Experienced aerodynamicists with VSP background will find these challenging new programs an exciting, stimulating climate in which to utilize and profit from their experience.

Investigate these forward-looking, pace-setting developments. If your experience and originality can advance Fairchild's rapidly-expanding program, you can be sure there's a big future waiting for you at Fairchild.

Investigate, too, the superb conditions for living and working near urban Baltimore and Washington, in the attractive Cumberland Valley. Fairchild offers outstanding company benefits: salary plans . . . paid pensions . . . health, hospitalization and life insurance . . . the many *extra* advantages of working with a genuinely progressive, fast-growing organization.

Send a detailed resume of your experience to Walter Tydon, Chief Engineer. All correspondence will be kept in strictest confidence, of course.

"where the future is measured in light-years"

ENGINE AND AIRPLANE CORPORATION
FAIRCHILD
Aircraft Division
HAGERSTOWN, MARYLAND

NMTBA MEETING

(*Continued from page* 164)

cept on those coming from the United States. At the same time a "compensatory" tax was added which, on machine tools, amounts to about 10 or 15 per cent. This tax, combined with the tariff and various other documentation and import levies and taxes of various kinds, adds in total about 55 per cent to the cost of an American machine tool when imported into France.

"We hope that the representatives of the U. S. will attack these artificial restrictions, in order that we may obtain some true reciprocity between the U. S. and other countries."

BOOKS . . .

MAGNETIC MATERIALS IN THE ELECTRICAL INDUSTRY, *by P. R. Bardell, published by Philosophical Library, 15 E. 40th St., New York 16, N. Y. Price, $10.00.* This volume should be welcomed by students, teachers and all engaged in research or manufacture in any of the many industries concerned with magnetism and magnetic materials. First-hand knowledge of the production, measurement and application of certain classes of magnetic materials, which has been applied and extended to assessing critically the whole available range in explicit relation to their applications is given. This treatment brings out clearly that the full realization of the high magnetic qualities of the modern materials is closely interrelated with the design of the systems in which they are to be utilized.

DIESEL ENGINEERING HANDBOOK, *edited by A. R. Newell, published by Diesel Publications, Inc., 192 Lexington Ave., New York 16, N. Y. Price, $8.50.* The new ninth edition comprises a comprehensive and up-to-date source of the latest in Diesel engine design, maintenance, and operation. It is written as a basic reference guide, for the beginner or expert in all industries using, servicing, or manufacturing Diesel engines and accessories. In line with the sharply increased use of Diesels in automotive and off-highway use, new chapters have been added—plus scores of new engine specifications listings—all devoted solely to these lightweight, high-speed Diesels. Over 900 separate Diesel topics are reviewed.

DICTIONARY OF MECHANICAL ENGINEERING TERMS, *compiled by J. G. Horner, revised by Staton Abbey, published by Philosophical Library, Inc., 15 East 40th St., New York 16, N. Y. Price, $6.50.* When the original edition of this work was compiled, the editor aimed at producing a comprehensive directory of general and traditional terms used by engineers of many types in numerous fields. Due to the considerable progress made in engineering technology since that time, this seventh edition has been completely revised and greatly enlarged by the inclusion of terms which have come into use during recent years.

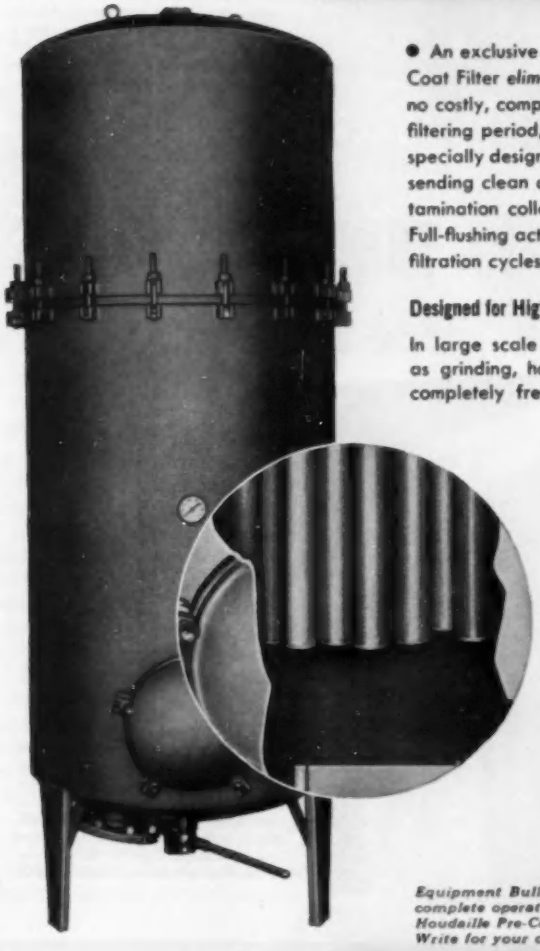
for water based and mineral oil coolants
used in central systems

new!

Houdaille Pre-Coat Filter

—the only filter of its kind that's

COMPLETELY SELF-CLEANING



● An exclusive backwashing feature built into the new Houdaille Pre-Coat Filter *eliminates manual cleaning entirely!* It works by gravity . . . no costly, complicated valves, piping or scrapers required. During the filtering period, constant pressure forces clean coolant upward into a specially designed dome. By simply stopping pump, this flow is reversed, sending clean coolant from dome down through tubular screens. Contamination collected on screen surfaces is washed away in seconds. Full-flushing action completely unclogs screen openings, assuring longer filtration cycles.

Designed for High Flow, High Efficiency in Precision Metal-Working Operations

In large scale production of precision metal parts, such operations as grinding, honing and lapping call for large volumes of coolant completely free of sludge, chips and other abrasive particles. The Houdaille Pre-Coat Filter provides the fast, thorough *micronic* filtration necessary to meet both production and quality control demands. One or more filters are mounted on a central system tank to handle any volume of coolant.

Features 199 Tubular Filter Screens

Tubular screens (see inset) are suspended beneath dome on a circular steel plate. Made of fine mesh Monel metal, space-saving tubes provide filtering surface equal to that of flat screens *while reducing tank diameter 30%.*

Takes Contamination Out, Leaves Additives In

Screens are coated with diatomaceous earth filter aid powder before filtration cycle begins. Diatomaceous earth removes the most minute solid particles without removing additives. In normal operation, only one pre-coat is needed daily.

Equipment Bulletin 701 gives complete operating data on the Houdaille Pre-Coat Filter. Write for your copy today.

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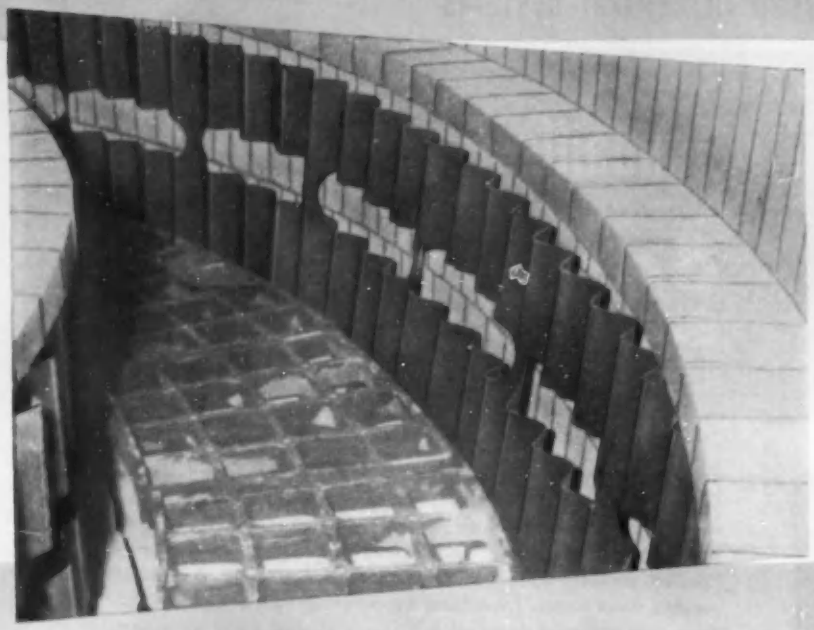
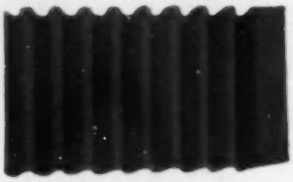


ELECTRIC



CORRTHERM elements are large corrugated sheets of nickel chromium and were developed in Lindberg laboratories by Lindberg metallurgists and engineers. At the left, installation of **CORRTHERM** elements in large rotary furnace currently being erected by Lindberg Industrial in plant of a leading automotive parts manufacturer.

FOR ELECTRIC FURNACES ... FOR GAS FURNACES

GAS

The famous Lindberg "dimple" vertical radiant tube, designed by Lindberg engineers has proved its superior efficiency in hundreds of furnace installations since 1953. The photograph at the left shows its installation in a large pusher-type furnace built for a leading automotive manufacturer.

Lindberg Industrial Corporation is ready to serve these industries: Aluminum, Automotive, Building Supplies, Copper & Brass, Ceramics & Glass, Plastics, Pulp & Wood Products, Steel and many others.

LINDBERG

LINDBERG INDUSTRIAL

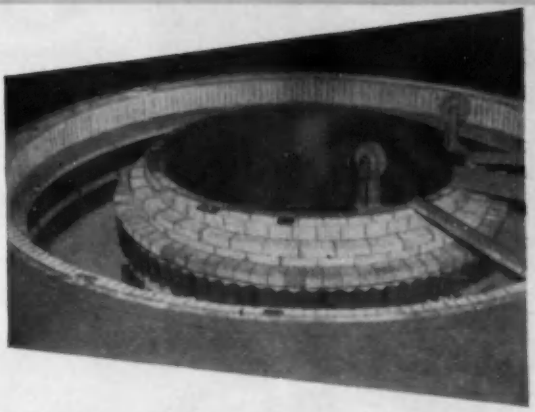
BY LINDBERG INDUSTRIAL!

Where source of heat is electricity!

CORRTHERM, Lindberg's radically advanced new electric heating element offers advantages never before available for heat treating furnaces. With this new element even carburizing and carbonitriding with electricity becomes practical, efficient and economical.

CORRTHERM elements operate at extremely low voltage. Consequently, leakage through carbon saturation and shock or short hazards are eliminated. Elements also act as baffles to direct circulation of convection streams.

CORRTHERM elements are practically indestructible. Work load or operator's charging tool can't hurt them. Watts density is at all time low. Easily installed or replaced, too, as element merely hangs in furnace and no complicated mountings are required.



A construction photo of one of two large rotary furnaces now being built by Lindberg Industrial for a leading automotive parts manufacturer. A section of this same furnace is shown on the opposite page.

THE MOST ADVANCED HEAT ELEMENTS YET DEVELOPED

Where gas is the source of heat.

Because of Lindberg's revolutionary design, this tube provides a new level of furnace performance. The secret lies in the new Lindberg tube's "dimples." The tube carries a central stream of mixed air-and-gas surrounded by a cylindrical stream of air alone. Combustion occurs in the area between these two streams. The "dimples" create eddies accelerating combustion and maintaining even temperatures along the entire tube.

This Lindberg tube will operate at maximum efficiency for a longer period of time. The special protective coating gives greatest possible resistance to carbon penetration. Vertical position eliminates soot deposit and resultant temperature increases at points of sooting.

Tubes are just 59 inches long and weigh only 29 pounds, changeable in a few minutes. No costly furnace shut-downs and no high labor and material cost for tube changes.

This three-row pusher-type carburizing furnace provides maximum heat uniformity through use of Lindberg vertical radiant tubes installed between each row as well as at side walls, providing accurate control of case depth and properties. This highly efficient furnace with Lindberg vertical radiant tubes carburizes 650 lbs. of gears per hour with an effective case of .055".

INDUSTRIAL CORPORATION

Specialists in Field-erected Equipment

CHICAGO PLANT: 2221 WEST HUBBARD STREET, CHICAGO, ILLINOIS
LOS ANGELES PLANT: 11937 REGENTVIEW AVE., AT DOWNEY, CAL.

Lindberg Industrial provides a complete engineering, designing and construction service including completed installation in your own plant. Call your nearest Lindberg Field Representative (see classified section of your telephone book) or write us direct.

ON OUR WASHINGTON WIRE

Government spending for defense is not going to drop much below the $34.5 billion mark in the year ahead. It actually will tend to nudge closer to the $35 billion mark.

Markets for new cars and the services needed to keep them rolling are headed for a sizable growth. Government forecasters predict that the U. S. will have at least 207 million people in 1975.

Administration officials are going to force a showdown with Congress on who has the final word on closing plants and ending services that compete with private business. Final round in the battle for control will come soon after Congress reconvenes in January.

Shop devices and techniques developed by the Air Force, such as a quick method of cutting fine pitch worm gears and a cable cutting and stripping tool, are described in a new Commerce Dept. research report. Called "New Shop Techniques and Developments" (PB 111668), it is available from the Office of Technical Services, Washington 25, D. C., for $0.75 a copy.

Renegotiation Board rules that concerns subject to its rules may exempt sales of stock items from their total sales in computing total profits. The new ruling is retroactive to Dec. 31, 1954, and will continue in effect through Dec. 31, 1956.

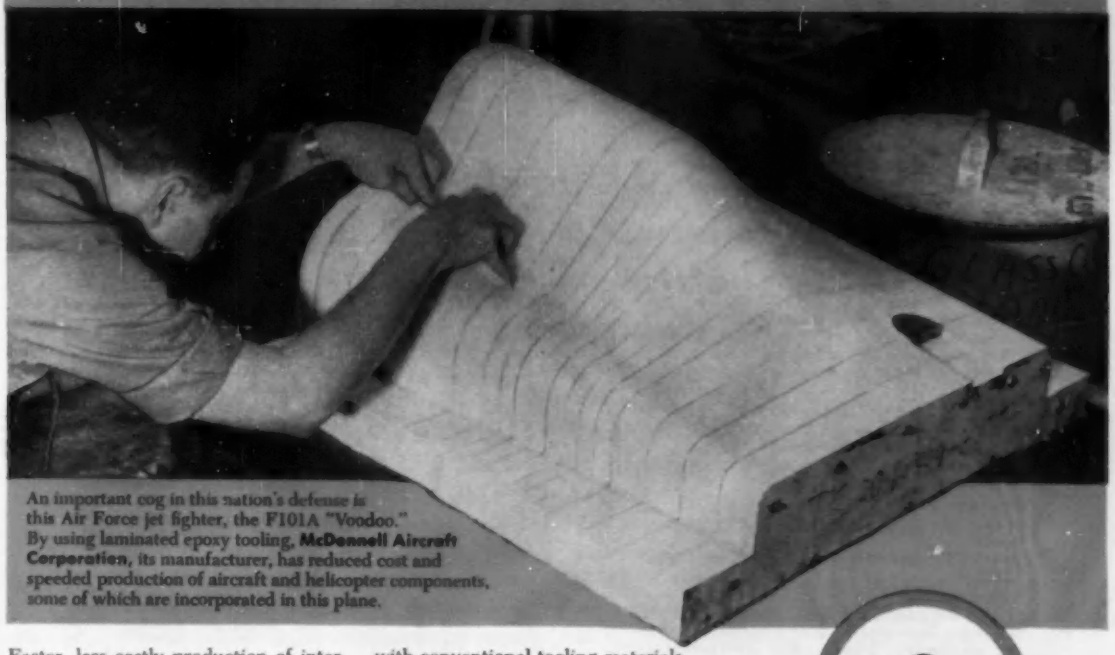
Concerns which built defense facilities in World War II under the old War Production Board's fast tax amortization program and did not receive tax benefits for the full cost can collect the difference from the Government.

Car and truck buying for civilian branches of the Government will now be handled by a new National Buying Div. of General Services Administration. Each year it will order more than $300 million worth of vehicles, lumber, and supplies and equipment for Federal use.

out of proper design comes the right motor for your product
With a Lamb Electric properly designed motor you obtain the motor qualities which are important to the success of your product.
Exceptional performance and dependability are standard with Lamb Electric Motors, at no increase in cost, because they are "custom tailored" by personnel having many years of experience in this field.
We would like to discuss these advantages with you for your new and redesigned products.
THE LAMB ELECTRIC COMPANY
KENT, OHIO
In Canada: Lamb Electric — Division of Sangamo Company Ltd. — Leaside, Ontario
Army tank ventilating blower motor.
For applications where high torque is required at high speed.
Lamb Electric
SPECIAL APPLICATION FRACTIONAL HORSEPOWER MOTORS

AUTOMOTIVE INDUSTRIES . . .
Is your News Magazine of Automotive and Aviation
MANUFACTURING

Compounds based on BAKELITE Epoxy Resins cut production costs, tooling time!



An important cog in this nation's defense is this Air Force jet fighter, the F101A "Voodoo." By using laminated epoxy tooling, **McDonnell Aircraft Corporation,** its manufacturer, has reduced cost and speeded production of aircraft and helicopter components, some of which are incorporated in this plane.

Faster, less costly production of interchangeable aircraft components results from the advantages of "Ren" tooling compounds based on BAKELITE Brand Epoxy Resins. For instance:

- Overall savings as high as 40 per cent have resulted where tools are adaptable to plastic.
- Weight of plastic tools is only 25 per cent that of similar steel or kirksite tools, 60 per cent that of aluminum tools.
- Savings in tooling-up time are as much as 40 per cent when compared with conventional tooling materials.
- Up to 75 per cent of all the interchangeable door panels used in one aircraft have been assembled and coordinated with tools made of BAKELITE Epoxy Resin—glass cloth laminates.

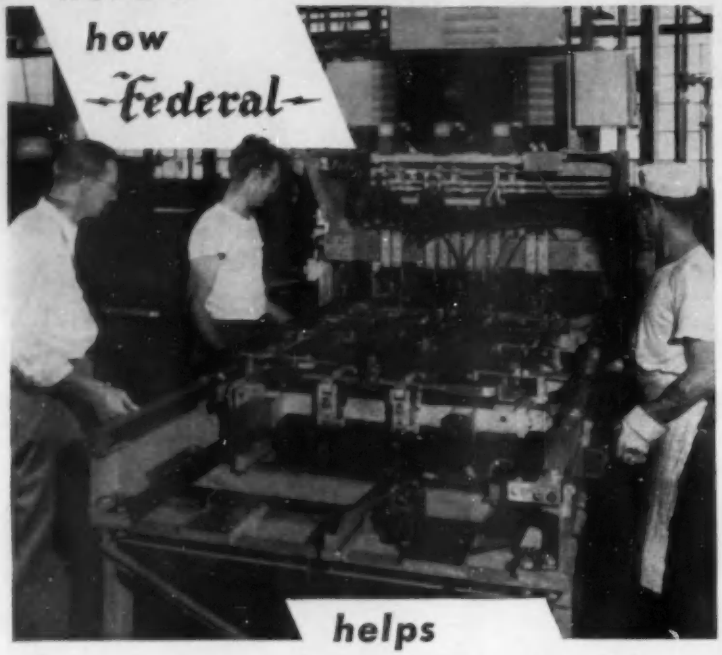
Epoxy plastic tooling compounds enabled this aircraft manufacturer to take advantage of the savings cited above. The compounds that are used are a product of **Ren Plastics, Inc.** (formerly Ren-ite Plastics, Inc.), P. O. Box No. 1256, Lansing 4, Mich.

BAKELITE
BRAND
EPOXY RESINS

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.

The term BAKELITE and the Trefoil Symbol are registered trade-marks of UCC

here's how -Federal-



helps Remington Rand make better office equipment

Now, a single operator using a special FEDERAL Multi-Spot Welder can readily meet Remington Rand's high production requirements on their desk top assemblies.

The desk top frame and reinforcing channel are spot welded to the flat sheet top in eighty places, using series welding principles with a minimum of marking on the show surfaces.

Parts are loaded and clamped on the welder die table which is anti-friction mounted on "V" guide ways and automatically indexed under the welding bridge.

Simple and flexible design features permit variable spot spacing in both directions. Pre-selected spot patterns and firing sequences, and readily adjustable part locators and clamps, make for a multi-purpose machine.

If you want the increased production possible with resistance welding equipment, but feel that the operation doesn't merit a single purpose machine, why not look into the possibilities of Federal Multi-purpose welders that can be designed to meet the requirements of several operations. Contact the Federal representative nearest you, or write direct for full information.

-Federal- WELDERS

Warco PRESSES

The Federal Machine and Welder Company
Warren, Ohio

CALENDAR

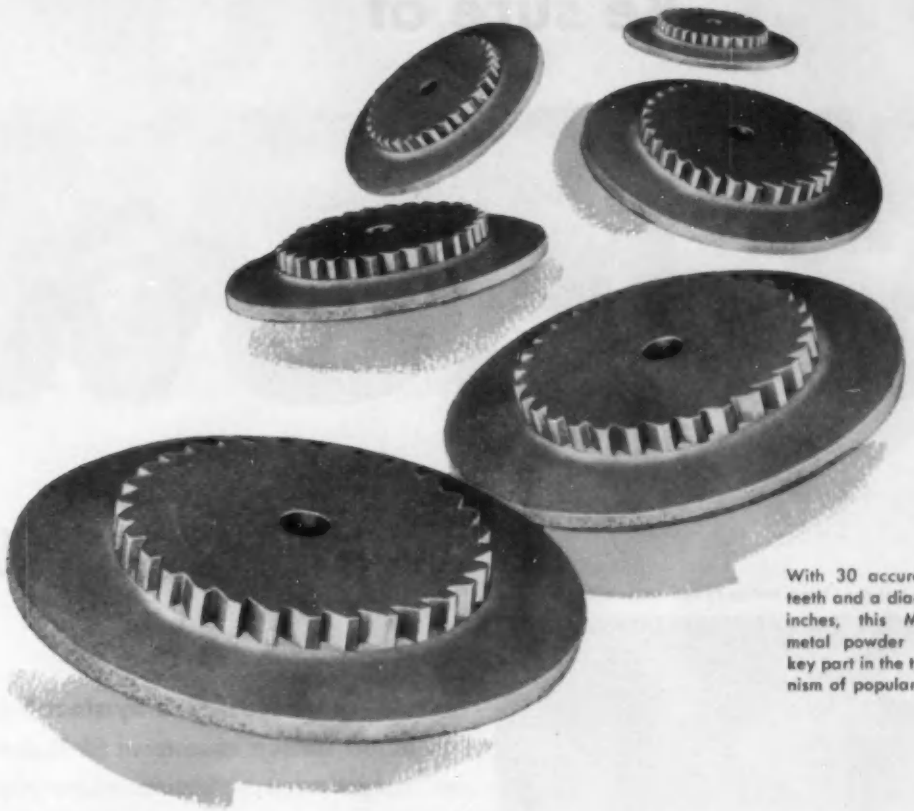
OF COMING SHOWS AND MEETINGS

ASME Diamond Jubilee Annual Meeting, Congress, Conrad Hilton, and Sheraton-Blackstone Hotels, Chicago, Ill. .....Nov. 13-18
Second International Automation Exposition, Navy Pier, Chicago, Ill. .....Nov. 14-17
American Petroleum Institute, annual meeting, San Francisco, Calif. .....Nov. 14-17
ASQC Mid-West Conference, Schroeder Hotel, Milwaukee, Wis. .....Nov. 17-18
Air Conditioning & Refrigeration Industry Exposition, Auditorium, Atlantic City, N. J. Nov. 28-Dec. 1
SPI Film, Sheeting, and Coated Fabrics Div. Conference, Hotel Commodore, New York, N. Y. .Dec. 6-7
International Atomic Exposition, Public Auditorium, Cleveland, O. Dec. 10-16
Material Handling Institute, annual meeting, Statler Hotel, New York, N. Y. .....Dec. 12-13
Nuclear Engineering and Science Congress, Public Auditorium, Cleveland, O. .....Dec. 12-16

1956

First Mexican International Automobile, Motor, and Cycle Show, Mexico City .....Jan. 1-10
Chicago Automobile Show, Chicago, Ill. .....Jan. 7-15
SAE Annual Meeting, Sheraton-Cadillac and Statler Hotels, Detroit, Mich. .....Jan. 9-13
Society of Plastics Engineers, annual conference, Hotel Statler, Cleveland, O. .....Jan. 18-20
AIEE Winter General Meeting, Hotel Statler, New York, N. Y. Jan. 30-Feb. 3
Automotive Accessories Mfgrs. of America Exposition, Navy Pier, Chicago, Ill. .....Feb. 6-9
SPI Reinforced Plastics Div. Conference, Hotel Chalfonte-Haddon Hall, Atlantic City, N. J. .Feb. 7-9
NSPA Convention, Mark Hopkins Hotel, San Francisco, Calif. Feb. 21-22
Pacific Automotive Show, Civic Auditorium, San Francisco, Calif. .....Feb. 23-26
SAE National Passenger Car, Body, and Materials Meeting, Hotel Statler, Detroit, Mich. .....Mar. 6-8
Geneva Automobile Show, Switzerland .....Mar. 8-18
National Association of Corrosion Engineers, annual convention, Hotel Statler, New York, N. Y. Mar. 12-16
Association of National Advertisers, spring meeting, Homestead, Hot Springs, Va. .....Mar. 14-16
SAE National Production Meeting and Forum, Hotel Statler, Cleveland, O. .....Mar. 19-21
ASTE Industrial Exposition, International Amphitheatre, Chicago, Ill. .....Mar. 19-23
SAE Aeronautic Meeting and Production Forum, and Aircraft Engineering Display, Hotel Statler, New York, N. Y. ....April 9-12
National Packaging Exposition, Convention Hall, Atlantic City, N. J. .....April 9-12
National Petroleum Institute, semi-annual meeting, Cleveland Hotel, Cleveland, O. .....April 18-20
Turin Motor Show, Italy..April 21-May 2

moraine engineering



With 30 accurately formed teeth and a diameter of 1 ½ inches, this Moraine-made metal powder ratchet is a key part in the tuning mechanism of popular auto radios.

...finding saving ways

The ways to lower costs are many . . . and Moraine engineers *know* many. The Moraine engineering policy is to look ahead—to think ahead—so that when a customer presents a troublesome problem a solution is generally reached. In Moraine—with its teams of design engineers to develop ideas and teams of process engineers to produce them—manufacturers have a dependable supplier of uniform high quality, top performing, reasonably priced parts.

To illustrate: The metal powder part pictured above costs a Moraine customer several cents less than the assembly it replaced. If you use parts in quantity, Moraine may find saving ways for you.

Moraine products include: Moraine-400 bearings, toughest automotive engine bearings ever made—Moraine friction materials—Moraine metal powder parts—M-100 engine bearings and Moraine conventional engine bearings—self-lubricating bearings—Moraine porous metal parts—Moraine power brakes—Delco hydraulic brake fluids—Delco master cylinders, wheel cylinders, lined brake shoes and parts.

moraine products

DIVISION OF GENERAL MOTORS, DAYTON, OHIO

Be sure of

LOW LOW LOW

with NATIONAL

Exclusive Syntech sealing lip cuts torque in half.

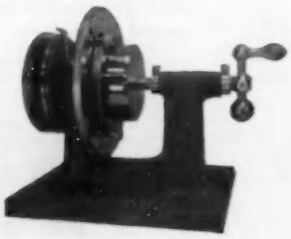
National Syntech® synthetic rubber seals are engineered for higher speeds and temperatures; applications where torque must be held to the absolute minimum. Syntech seals have unique sealing lip design to provide minimum contact between lip and shaft. This design reduces torque up to 50% over conventional sealing lips. Operation is cooler; service life is longer, and there is no measurable leakage. National Syntech seals are available with rubber covered or ground metal O.D.'s, and are unaffected by most industrial fluids.

National Micro-Torc oil seals employ a sealing lip of leather, surface coated with a high lubricity elastomer. The exceptional lubricity of

Shaft Size	Break Away Torque		Running Torque	
	Conventional Leather	Micro-Torc	Conventional Leather	Micro-Torc
1.500"	39 oz-in	7 oz-in	60 oz-in	56 oz-in
2.937"	126	29	253	166
3.812"	93	49	287	207

Micro-Torc's surface coating permits cooler running, "inside" oil storage, lower torque.

New, portable meters measure oil seal torque to 60 in. lbs.



TORQUE
TORQUE
TORQUE

OIL SEALS

this coating helps reduce torque as much as 80%, yet permits operation with no measurable leakage. Because the coating is surface only, the body of the sealing lip retains its inherent porosity to store oil for periods of semi-starved operation. Operation of Micro-Torc is cooler, and service life is materially longer.

National Torque Meters fill industry's need for a quick, accurate way to measure oil seal torque in standards determination, quality control and parts inspection. They provide laboratory accuracy, yet are rugged, fool-proof, easily used by anyone. Two models are offered: one measuring torque to 15 lb. in. on seals to 6" diameter and one measuring torque to 60 lb. in. on seals to 8" diameter.

Factory trained field engineers at your service

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NEWARK, N. J. . . . *Suite 814, 1180 Raymond Blvd., MItchell 2-7586*
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O-RINGS SHIMS

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RAYONIC
CATHODE RAY TUBES
by Waterman

3XP RAYONIC CATHODE RAY TUBE provides a brilliant and sharply-defined trace and high deflection sensitivity at medium anode potentials. When comparing 3RP operating at 1000 volts second anode against 3XP operating at 2000 volts, the results are astonishing. For the same spot size, 3XP light output is improved by a factor greater than 4, vertical deflection sensitivity improved by a factor of 2, while the horizontal sensitivity remains unchanged. Because 3XP is enclosed in a short envelope and has half the inter-electrode capacities of the 3RP, the tube lends itself admirably to high frequency video work as well as for low repetitive operation.

TECHNICAL DATA The basic properties of the cathode ray tube that concern the designer or the user are: deflection sensitivity, unit line brightness, line width, static voltage requirements and physical size. A comparison between cathode ray tubes manufactured by Waterman Products Company is shown in the table below. These tubes are available in P1, P2, P7 and P11 phosphors. 3JP1, 3JP7, 3SP1 and 3XP1 are available as JAN tubes.

TUBE	PHYSICAL DATA			STATIC VOLTAGE			DEFLECTION*		LIGHT OUTPUT**
	Face	Length	Base	A3	A2	A2 Max.	Vert	Hor	
3JP1	3"	10"	Med Diheptal	3000	1500	2000	111	150	352
3MP1	3"	8"	Sm Duodecal		750	2500	99	104	33
3RP1	3"	9⅛"	Sm Duodecal		1000	2750	61	86	44
3SP1	1.5x3"	9⅛"	Sm Duodecal		1000	2750	61	86	44
3XP1	1.5x3"	8⅜"	Loctal		2000	2750	33	80	218

*Deflection in volts per inch.
**Light output of an element of a raster line (one mm long and not exceeding .05mm in width) in microlumens.

All heaters 6.3 V AC, .6 AMP.

WATERMAN PRODUCTS CO., INC.
PHILADELPHIA 25, PA. CABLE ADDRESS: POKETSCOPE

MEMO... Write for details today!

WATERMAN PRODUCTS

WATERMAN PRODUCTS INCLUDE
3JP1, 3JP7, 3SP1, 3XP1 JAN RAYONIC® Cathode Ray Tubes
3JP—3MP—3RP—3SP—3XP RAYONIC CATHODE RAY TUBES
Available in P1, P2, P7, and P11 Phosphors
POCKETSCOPES® PULSESCOPES® RAKSCOPES®
And Other Associated Equipment

Hydraulics Conference

(*Continued from page* 57)

mechanism is set in action and holds the valve in place when positioned to raise or lower a double acting cylinder. When the cylinder moves to the end of its set stroke, the high pressure oil acting on a check valve set to open at 1200 psi, enters a chamber in the spool valve center and by acting against a small piston plunger, causes the spool valve to move toward neutral. This initial movement causes a small garter spring to release its hold on the valve, thus allowing the valve to return to neutral due to forces of a centering spring. This action can be accomplished from either the raise or lower position.

Aircraft

Aircraft currently in the design stage will require hydraulic pumps to operate in the range of minus 100 F to somewhere between 400 and 600 F within the next few years, according to J. A. Mileti, of Bendix Aviation Corp. The design of these pumps requires that careful attention be given to viscosity effects of fluids used, thermal changes in pump dimensions, decreased strength of materials and the annealing effect of high temperature on hardened bearing surfaces, he said.

Air Ride

An air-hydraulic suspension system for passenger cars was described, which is designed to give a soft, low frequency ride with adequate damping and constant riding height. Donald W. Lipp of Monroe Auto Equipment Co. explained that low oscillation frequency is one of the basic considerations of his firm's suspension system. The frequency may be adjusted over a wide range. He described two types, bellows type and a metal cylinder type. In each, the internal pressure increases as the load increases, thus raising the load deflection rate. This automatically compensates for load changes. However, since the oscillation frequency is proportional to deflection, and since a leveling valve maintains a constant deflection, frequency remains constant. Lipp spoke in favor of frequencies well below the accepted value of 78 cycles per minute as being suitable.

The system eliminates harshness caused by friction and so-called fade

(*Turn to page* 188, *please*)

NEW Le Tourneau

Sno-Freighter

This huge transporter, 274 ft long, is designed to carry freight and supplies across Arctic wastes, terrain that's impassable for other vehicles. Designed and built by R. G. LeTourneau, Inc., Longview, Texas, the Sno-Freighter is powered by individual electric motors mounted on each wheel. Two 400-hp diesel generator sets furnish the electrical energy. Each unit has two starters and each of these, in turn, uses four 6-volt Globe standard commercial batteries.

GLOBE batteries help assure SPINNING STARTS despite Arctic cold, extra-rugged terrain

Here's more assurance for private label marketers that Globe batteries pay off in outstanding performance . . . performance that builds more and more repeat sales. R. G. LeTourneau, Inc. is typical of the many leading equipment manufacturers who rely on Globe batteries because they know fast, sure, dependable starts can mean lives or dollars.

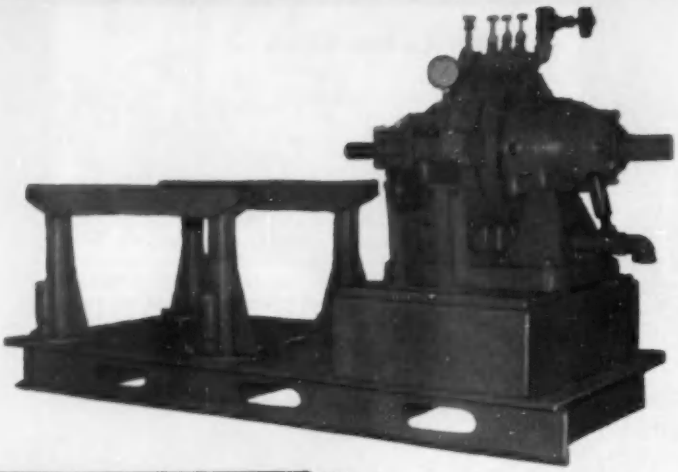
GLOBE-UNION INC., Milwaukee 1, Wis.

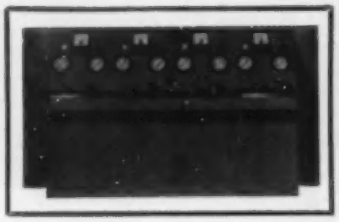
For fast service there are 16 Globe Battery Plants—

Atlanta, Ga. • Boston, Mass. Cincinnati, Ohio • Dallas, Texas Emporia, Kansas • Hastings-on-Hudson, N. Y. • Houston, Texas • Los Angeles, Calif. Memphis, Tenn. • Milwaukee, Wis. • Mineral Ridge, Ohio Oregon City, Oregon Philadelphia, Pa. • Reidsville, N. C. • San Jose, Calif. Ajax (Ontario) Canada

IF IT'S PETROLEUM-POWERED *there's a Globe-built battery . . . right from the start!*

HI-EFF TAYLOR DYNAMOMETERS





For Production and Laboratory Testing

Widely used by manufacturers of

• TURBINES • DIESEL ENGINES
• GASOLINE ENGINES • PUMPS • BELTS
• SPARK PLUGS • PISTON RINGS
• SUPERCHARGERS • ELECTRIC MOTORS
• TRANSMISSIONS and DIFFERENTIALS

Electric and Hydraulic Dynamometers—Write for Bulletin 761

TAYLOR DYNAMOMETER & MACHINE CO.

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MANUFACTURERS OF DYNAMOMETERS • BALANCING MACHINES • DRILLING MACHINES

International Division—Dumman World Trade Co., Milwaukee 6, Wis., U. S. A.

Machining Integral Stiffened Spars

(*Continued from page* 98)

Spars for the A4D wing tank that are the backbone of its wing are of three types: the front, the intermediate and the rear spar. Their weights in the blank stage are approximately as follows: front, 665 lb; intermediate, 500 lb; rear, 375 lb; with a total approximate weight of 1540 lb.

Completely sculptured, these integrally stiffened spars weigh 78 lb, 68 lb, and 33 lb, respectively—a total of 179 lb for the three.

From weight analyses of comparable made-up structures, this one-piece spar construction has a weight saving in the neighborhood of 20 per cent and this at no sacrifice of strength. This, interpreted into advantages, permits greater fuel load in the airplane and produces more economical and faster manufacture.

Public Sale of FORD STOCK

(*Continued from page* 106)

sold or transferred outside the family, they must first be converted into shares of new Common Stock with one vote per share.

So long as there are at least 2,700,000 shares of the new "B" Stock outstanding, these shares will carry sufficient votes per share to give the outstanding "B" Stock in the aggregate a maximum of 40 per cent of voting rights. This percentage will be reduced to 30 per cent when the outstanding shares of the new "B" Stock fall below 2,700,000 shares. When the outstanding shares of the new "B" Stock fall below 1,500,000 shares, the new "B" Stock will no longer carry any specified percentage of voting rights, but will carry only one vote per share—just like the new Common Stock.

3. The Ford Foundation would own 39,396,327 shares of new non-voting "A" Stock. If any of these shares are sold to the public, it is planned to convert them into shares of new Common Stock with one vote per share.

Trustees: Frank W. Abrams, James F. Brownlee, John Cowles, Donald K. David, Mark F. Ethridge, H. Rowan Gaither, Jr., Laurence M. Gould, John J. McCloy, Charles E. Wilson, Charles E. Wyzanski, Jr.

THIS IS WHAT CAN BE DONE WITH THE CECOSTAMP . . .

A 48 x 36 Cecostamp is making road signs, metal ceilings, auto body parts, roofing trim and grain bins at an up-to-date metal stamping concern in Canada.

Formerly made on a rope drop hammer, these stampings as produced on the Cecostamp are sharper and more distinct, production has been increased up to 10% and rejects have been greatly reduced, saving time and material. Operation is also easier and safer.

Have you a stamping problem that might be solved by installing Cecostamps? Investigate this air-operated impact type drop stamp, using blows of controlled intensities, the control being completely and instantly at the will of the operator.

Write for a copy of our latest Bulletin No. 30-L-5

Above are a few of the familiar road signs produced on the versatile Cecostamp.

CHAMBERSBURG CECOSTAMP

CHAMBERSBURG ENGINEERING COMPANY · CHAMBERSBURG, PENNSYLVANIA

Industry News

(*Continued from page* 104)

Ford of England Unveils Its New Research Center

British Ford has formally opened an Engineering Research Station at Birmingham, England. Staffed by 200 skilled engineers, it is concerned with long-term applied research, rather than with current production problems.

Facilities include: physics laboratory to investigate basic engine problems; metallurgical laboratory equipped with a 4500-diam microscope and a gamma ray installation; chemical, paint, and electrical laboratories; and several engine test bays fitted with a battery of dynamometers and with precision scales for fuel consumption measurements.

Bid Made By Aerojet On "Satellite" Work

Aerojet-General Corp., a subsidiary of General Tire and Rubber Co., may take part in the Government's program to build a device for launching a proposed earth-circling satellite. According to the Defense Dept., the company is one of several concerns which have submitted proposals for the contract.

Names of companies which will participate in the project are expected to be announced shortly. Aerojet has been making rocket and guided missile components for the military for some time.

Ford Donates $45,000 To Four Universities

Another grant to higher education has been made by an automobile company. Ford has set up a new program to broaden communications channels between industry and universities.

It has made an initial contribution of $45,000 to four educational institutions. They are Massachusetts Institute of Technology, California Institute of Technology, Univ. of Toledo, and Univ. of Michigan.

Two Jet Fighters for Navy Are Developed by McDonnell

Development of two new Navy jet fighter aircraft was revealed in the recently issued 1955 annual report of McDonnell Aircraft Corp. The company announced that it had a production order for a missile carrying version of the Demon, which will be designated the F3H-2M. Deliveries of this new fighter will start in the near future.

McDonnell also announced that it has a development contract for another new Navy fighter whose designation has been changed in the past few days from the AH-1 to the F4H-1. Work is under way on this contract, but further details are classified.

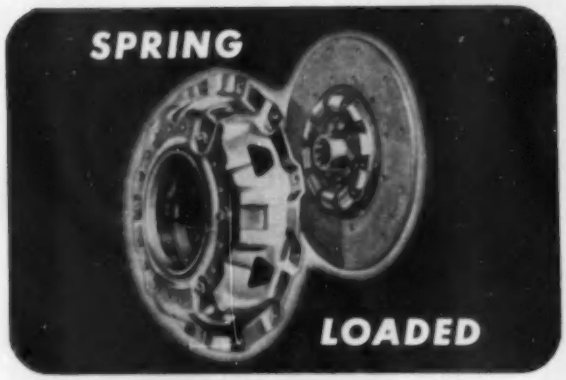
Volkswagen Hanover Facility To Produce Commercial Units

Volkswagen's new assembly plant at Hanover, Germany, is now close to completion. Production of Microbuses, transporters, and other vehicles in its commercial range will be transferred from its main plant at Wolfsburg before the end of this year.

By the middle of 1956, output is planned to reach a maximum of 300 units per day. Meanwhile, floor space released at the Wolfsburg factory will make possible a production increase in the Volkswagen car of nearly 50 pct—from the present daily figure of just over 1000 units to 1500.

(*Turn to page* 186, *please*)

ROCKFORD



ACCURATELY BALANCED

LIGHT-PEDAL PRESSURE
CUSHIONED ENGAGEMENT
VIBRATION DAMPENING
ACCURATE BALANCE
DIRT EXCLUSION
HEAT DISSIPATION
LIFETIME ADJUSTMENT

* All ROCKFORD Spring Loaded CLUTCH plates not only are carefully checked for accuracy of dimensions but are inspected on a rotary static balancing machine. Uniform operation, minimum wear, less-frequent adjustment and long life qualities of ROCKFORD Spring Loaded CLUTCHES thus are protected during production.

Send for This Handy Bulletin

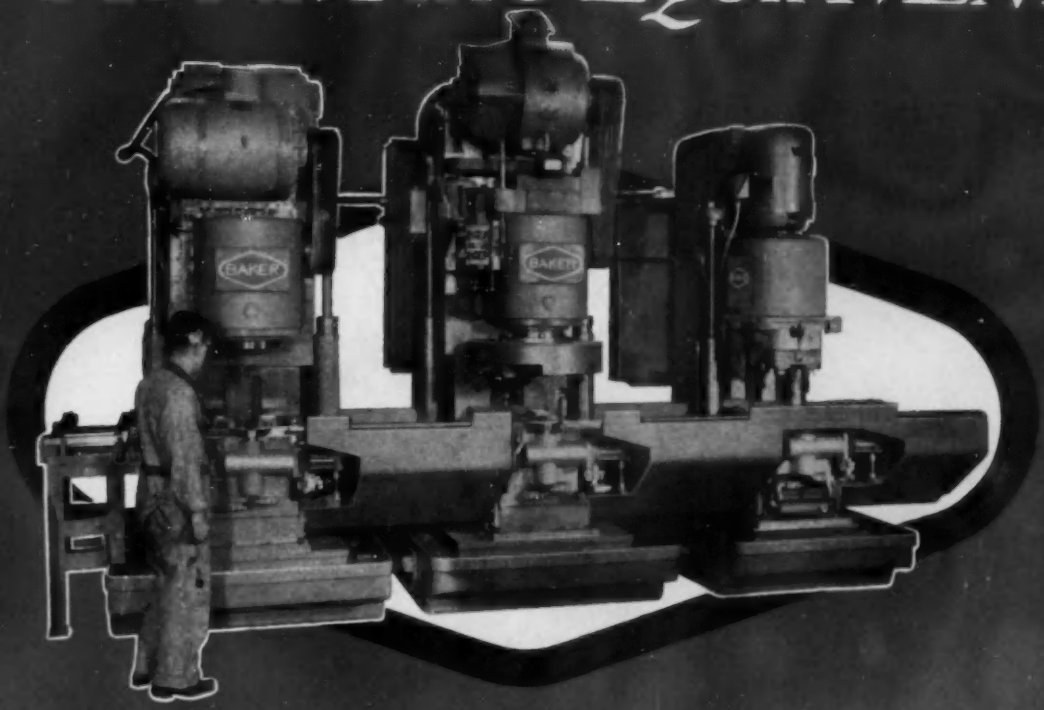
Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

ROCKFORD CLUTCH DIVISION BORG-WARNER
▲ 315 Catherine Street, Rockford, Illinois, U.S.A. ▲

CLUTCHES

The Average Shop Needs and Now Can Afford

AUTOMATIC EQUIPMENT



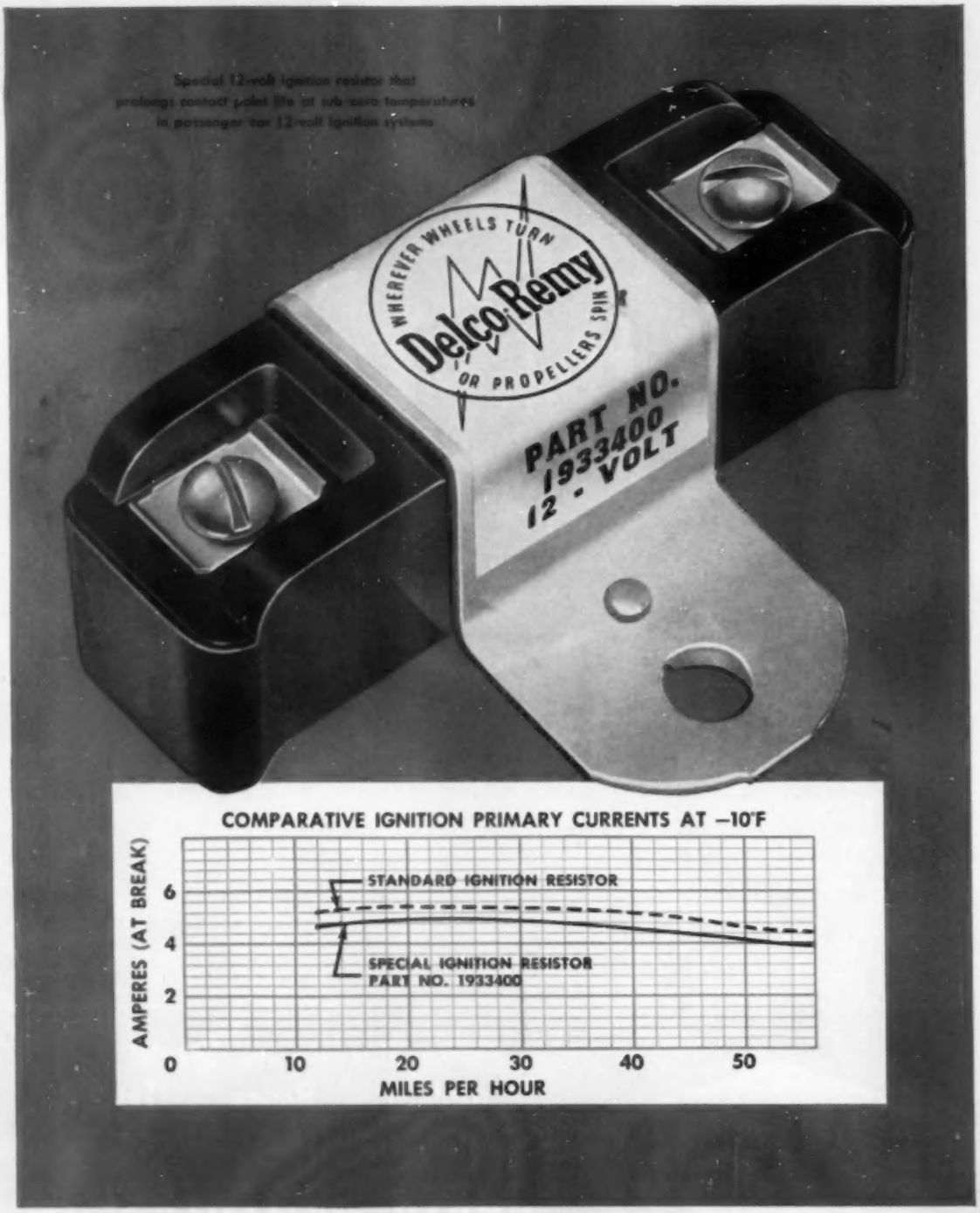
The new three standard unit Baker Machine introduced at the show, is combined to operate as a transfer machine, set up with a low cost, simplified fixture, proving the possibility of providing automatic machines through use of STANDARD MACHINES . . . And thereby achieving automation without tremendous expenditure. Operations on the new Baker Transfer are Combination Bore & Counterbore . . . Face (cross feed) . . . and Multiple Drill . . . All Automatically. Write regarding your specific job problems.

BAKER

Standard and Special
Drilling . . . Boring . . . Tapping
Keyseating and Contour Grinding Machines

BAKER BROTHERS, INC.
TOLEDO 10, OHIO

Progressive Engineering



Makes the Difference

SPECIAL DELCO-REMY 12-VOLT RESISTOR PROTECTS IGNITION POINTS EVEN IN PROLONGED SUB-ZERO WEATHER

The *engineered* answer to sub-zero weather starting problems resulting from burned distributor contact points in Delco-Remy 12-volt passenger car ignition systems is the new Delco-Remy No. 1933400 special ignition resistor.

This special-duty unit solves such problems *at the source* by protecting contact points from the abnormally high primary currents which often occur during prolonged, extremely cold weather. With a No. 1933400 resistor on the job, contact points stay clean and continue to operate at summertime efficiency even in sub-zero weather, assuring easier starting, better ignition, longer point life.

Through such developments resulting from constant study of service problems, Delco-Remy is always abreast—often ahead—of developments in the automotive industry. Whenever the need arises for further advances in automotive electrical equipment, count on Delco-Remy to be ready.

Delco-Remy
ELECTRICAL SYSTEMS

DELCO-REMY, DIVISION OF GENERAL MOTORS, ANDERSON, INDIANA

. . . or anything in-between . . .

ASSEMBLED PRODUCT

Follansbee's Sheet Metal Specialty Division is now equipped to produce from raw stamping to completely fabricated, finished, assembled and packaged product—even though the stamped metals are only a minor part of the completed job!

No matter what your requirements are or how intricate your specifications, Follansbee engineers will work with you in designing or redesigning your component parts. Complete tool room and die making facilities are available as well as one of the most modern finishing and assembling lines in the industry.

Call Follansbee engineers in early to discuss your stamping problems. A cost analysis on your job will be submitted without obligation.

SHEET METAL SPECIALTY DIVISION

FOLLANSBEE

STEEL CORPORATION

BOX 567 • FOLLANSBEE, WEST VIRGINIA

Industry News

(*Continued from page* 182)

Focke Patents New Plane With Wings That Rotate

Wings that will rotate and assume a circular-cylindrical appearance while moving identify an unusual new aircraft just patented by the U. S. Patent Office

Invented by Henrich C. J. Focke, founder of the German Focke-Wulff Co., the plane combines features of the helicopter and the conventional aircraft. With its nose pointed upward at a sharp angle to the fuselage, it resembles in profile a sitting bird.

The propellers are placed alongside the nose, well in advance of the wings. Vertical takeoffs are said to be possible, and the machine is designed to hover in mid-air.

Wings are made to revolve when the plane takes off and climbs to a cruising altitude. The cylindrical appearance is ascribed to the effect of centrifugal force on the wing covering. When the plane is placed on a horizontal course, the wings are flattened in flight.

Canadian Car Demand Seen As Continuing Quite High

There seem to be a number of reasons for anticipating an annual demand for cars in Canada in the next several years at least as high as the average of 315,000 cars a year of the past five years. Replacement needs alone suggest minimum requirements of more than 200,000 cars a year. Furthermore, population growth and higher incomes might bring the volume to upward of 300,000 units a year.

The number of passenger cars on Canadian streets and highways has been rising at a rapid rate since the war. At the end of 1954, there were almost 2.7 million passenger cars registered, compared with 1.2 million at the end of 1946.

Ford Div. Forms Section To Review Data Systems

A new department has been formed by Ford Div., to be headed by J. W. MacArthur, formerly interdivisional sales manager. Basic function of the new unit, to be known as the Systems Integration Dept., will be to review data systems and ways to simplify them, as well as supplementary tabulator and computor applications.

S·O·S

Symbol of Service for 49 years . . .

Supplier of Inner Coil Spring Units to Mattress and Furniture Manufacturers.

Supplier of Brake, Clutch, Valve, and Other Mechanical Springs to the Automotive and Other Industries.

Supplier of "Star Service" All Wire and "Paper-Strut" Garment Hangers to Cleaners and Dyers.

Supplier of Interior Metal Trims and Spring Seating Units to the Automotive Industry.

Supplier of Fuselages and Ammunition Components to the Armed Services.

Supplier of Racks and Shelves to the Refrigerator and Stove Manufacturers.

L. A. YOUNG SPRING & WIRE CORPORATION

GENERAL OFFICES: Detroit 11, Michigan

IN CANADA: L. A. YOUNG INDUSTRIES, Ltd., Windsor, Ont.

AGMA Meeting

(*Continued from page* 72)

mittee is proposing to seek an inspection method standard for very fine pitch gears. The Spur, Helical and Herringbone committee, together with the Gear Rating Coordinating committee, reviewed its proposed durability standards and will provide a task force to check the formulas and report at the next meeting. The Machine Tool Task committee at its first meeting decided to circulate a questionnaire to machine tool manufacturers to help determine what it should cover first in the way of standards for machine tool gearing.

New Developments

Committees of the Development Div. reported on the latest standards for materials inspection and lubrication. The Materials committee approved, as a tentative standard, physical specifications for gear materials of ductile iron. These were worked up in connection with standards of the ASTM, Defense Dept. and International Nickel Co. covering nodular iron. Formulas for strength of gear teeth recently written were discussed by the Gear Rating committee and will be submitted to other committees for checking. The Lubrication committee reported a preliminary survey on synthetic lubricants. The Spline committee, a joint AGMA-ASA meeting, announced that standards for gaging of splines and serrations will be combined within six months. The Inspection committee announced that it will sub-divide the present broad range of coarse pitch gears.

The Industry Problems Div. requests all interested firms to participate in a meeting next month to discuss the new industry-wide report made by an outside firm. This meeting will be held in New York City or Washington, and details may be obtained from AGMA headquarters, No. One Thomas Circle, N. W., Washington, D. C.

Fully automatic BURR-MASTERS
for deburring internal & external gears and splines
ABOVE: MODEL BMI-15 FOR INTERNAL GEARS
BELOW: MODEL BME-24 FOR EXTERNAL GEARS
• Entire tooth form including root deburred and chamfered at 5 teeth per second—automatic load, deburr and unload
• Production not limited to a single gear—changes in automation tooling permit wide work range
• Long-life form tools assure maximum production between grinds, rapid changeover
• Two-station BME-24 deburrs both sides of external gears from ⅜" to 6½" P.D. Single-station BMI-15 handles internal gears from 2" to 20" P.D.
MODERN
Industrial Engineering Co.
14330 BIRWOOD AVE.
DETROIT 38, MICHIGAN

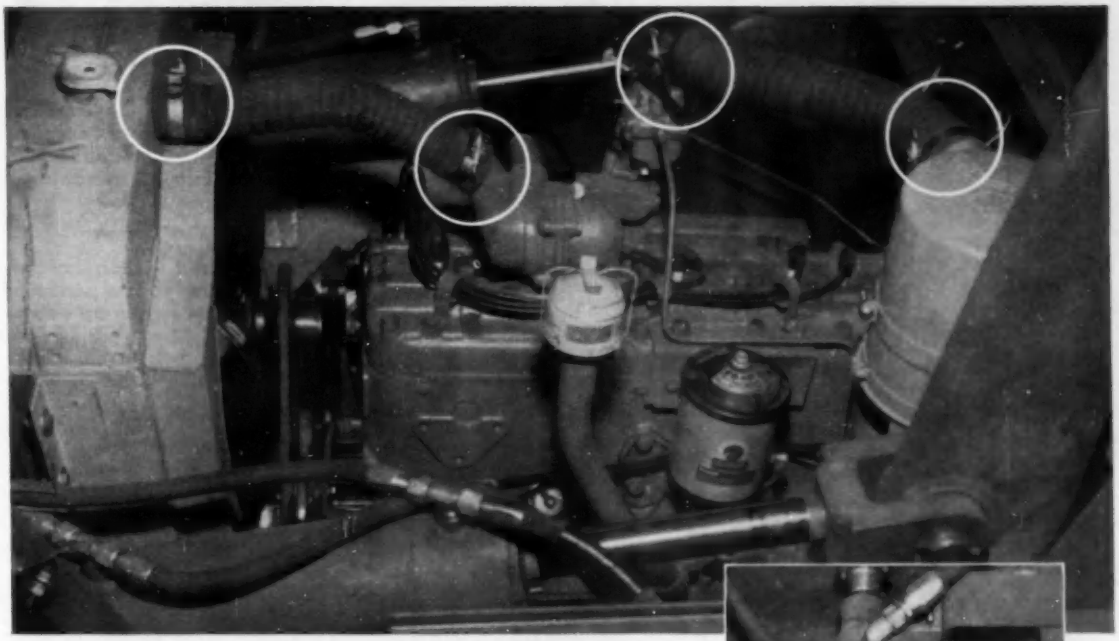
Hydraulics Conference

(*Continued from page* 178)

of shock absorbers due to aeration. Basically, the air spring has an integral hydraulic shock absorber together with an automatic leveling valve, air compressor and reservoir tank. One type has two metal cylinders mounted concentrically to telescope one into the other. Synthetic rubber seals maintain air pressure and special anti-friction bearing rings resiliently mounted permit self-alignment. The second type Lipp tested is the rubber bellows design which produces a change in volume as the axle moves up and down. The percentage of corresponding increase or decrease in air pressure can be regulated with an expansion tank. The tank size also has a bearing on oscillation frequency, he explained. This system has the advantage of simplicity but is more difficult to design with a low enough oscillation frequency. The shock absorber in each design is supercharged with the available air pressure to insure proper loading and eliminate fade. The compressor so far used delivers air at 150 psig.

R. R. Peterson of Chrysler Corp. listed some additional advantages which he sees in this type of system. These include overcoming rate build-up in jounce, possible elimination of the hydraulic shock absorber, soft dynamic springing in pitch and roll, and elimination of the sway bar.

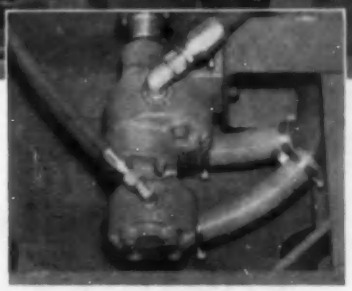
"Marman Makes it Possible to Standardize on One Type of Clamp," reports Hyster Company



Hyster Company of Portland, Oregon, simplified clamping problems on lift truck production with the Marman Universal Clamp. The same versatile clamp is used on engine radiator and air filter lines and hydraulic pump units.

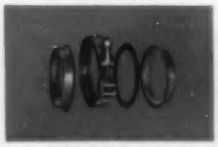
A Hyster official says, "This Marman clamp makes it possible to standardize on one type of clamp, but in different sizes, and the speed with which they can be installed is a very big factor on the assembly line."

You, too, can simplify clamping problems with the Marman Universal Clamp. For full information on Marman's complete line of clamps, couplings and straps, write us today.



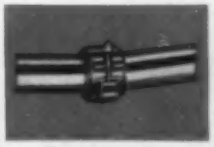
This hydraulic pump on a Hyster lift truck uses Aeroquip hose lines as well as Marman clamps.

Channel bend coupling



LIVE joint system

Adjustable band clamp



Flexible coupling

V-band coupling

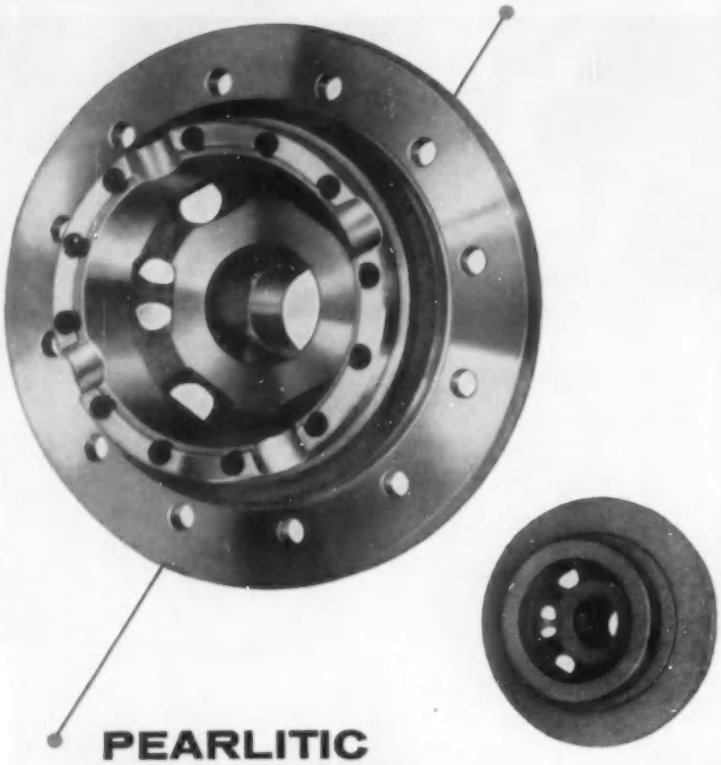
MARMAN PRODUCTS COMPANY, INC.

SUBSIDIARY OF Aeroquip CORPORATION

11214 EXPOSITION BLVD., LOS ANGELES, CALIFORNIA

MARMAN PRODUCTS ARE MANUFACTURED UNDER VARIOUS U.S. AND FOREIGN PATENTS AND OTHER PATENTS PENDING

MACHINABILITY INDEX 80-90*



PEARLITIC MALLEABLE CASTINGS

*B1112 STEEL = 100

Low machinability index of 80-90 (B1112 steel = 100) is probably reason enough to warrant serious consideration for your product.

But pearlitic malleable castings—from National—don't stop there. They have great ultimate strength . . . resist wear under heavy loads at high speeds . . . make excellent non-seizing bearings . . . can be air or liquid-quenched . . . can be smooth-finished.

Don't overlook the advantages of pearlitic malleable. For pearlitic malleable castings—from National—can often reduce manufacturing costs, weight and assembly time . . . can increase the sales potential of your product. AA-1806

NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY

Cleveland 6, Ohio

The Nation's largest independent producer of malleable and pearlitic malleable

SHORTIES

The manufacture of aircraft and guided missiles of a typical aircraft company requires the use of more than 19 million sq ft of blueprints per year.

●

Three-hundred gallons of jet fuel are required to taxi a current jet bomber from warm-up ramps to the end of a runway for take-off—generally a distance of about one and one-half miles.

●

Each swept-back wing of a modern jet bomber contains 14,698 bolts and rivets—some with tolerances as small as .0015 of an inch.

●

The average full-time industrial employee earned $4050 in 1954 and forked over to Uncle Sam $250 in income taxes alone.

●

The U. S. oil industry provides work for nearly 165 million persons.

●

In 1954, approximately 6.201 million tons of corrugated and solid fibre boxes were produced in the U. S.

●

Approximately 100,000 gal of water per minute, as much as is used by the entire city of Washington, D. C., are required to cool motors used in a new air force wind tunnel.

●

Families with incomes of $5000 or more—one-third of the nation's families—now account for three out of four new cars sold today.

●

In 1947, farm motors accounted for 22.1 per cent of the total U. S. consumption of automotive lubricating oil. By 1953, that percentage had risen to 24.3 per cent—nearly a quarter of the total.

"Operations Kingsbury" drills tubular valve in 5 seconds

A large manufacturer sent us a small piece of steel which had been partially completed on a screw machine. He said: "Drill five holes and remove the burrs . . . " That's a job for any drill press!

But when he said: "I want over 700 pieces an hour gross . . . "

THAT'S A JOB FOR A KINGSBURY.

Here's the machine. Four horizontal units and one vertical unit are mounted on a 72-inch diameter semi-circular base. A 20-inch table with four work-holding fixtures indexes through four stations.

Work is performed at three stations, as follows: *Station 1:* Unit 1-H with two-spindle offset auxiliary head, drills two holes from one direction, while Unit 1-Rear with a single spindle auxiliary offset head, mounted on the other side of the base, drills the opposing hole.

Station 2: Units 2-HTL and 2-HTR drill opposing holes.

Station 3: Unit 3-V, with special burring tool, removes the burrs from five holes.

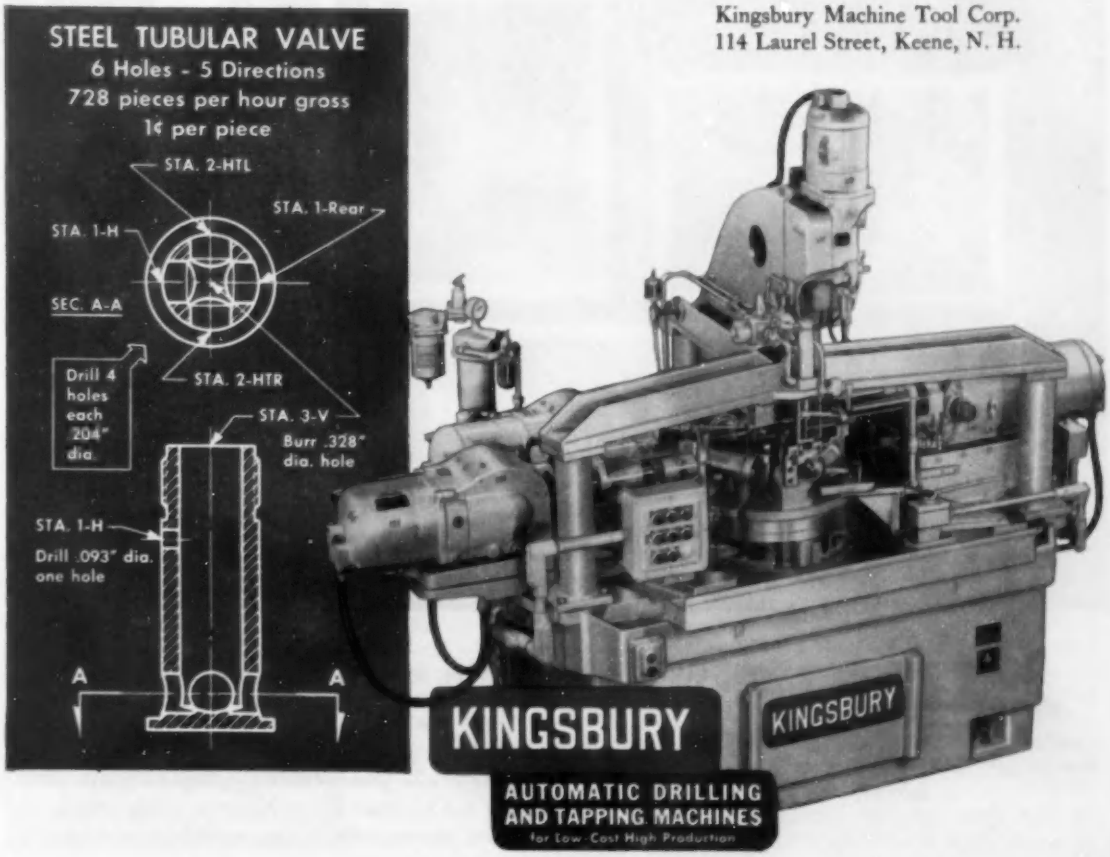
At Station 4 the work-holding fixture automatically releases the piece and ejects it through the bottom of the fixture. The operator then reloads. The piece is clamped automatically in the fixture with the flange at bottom.

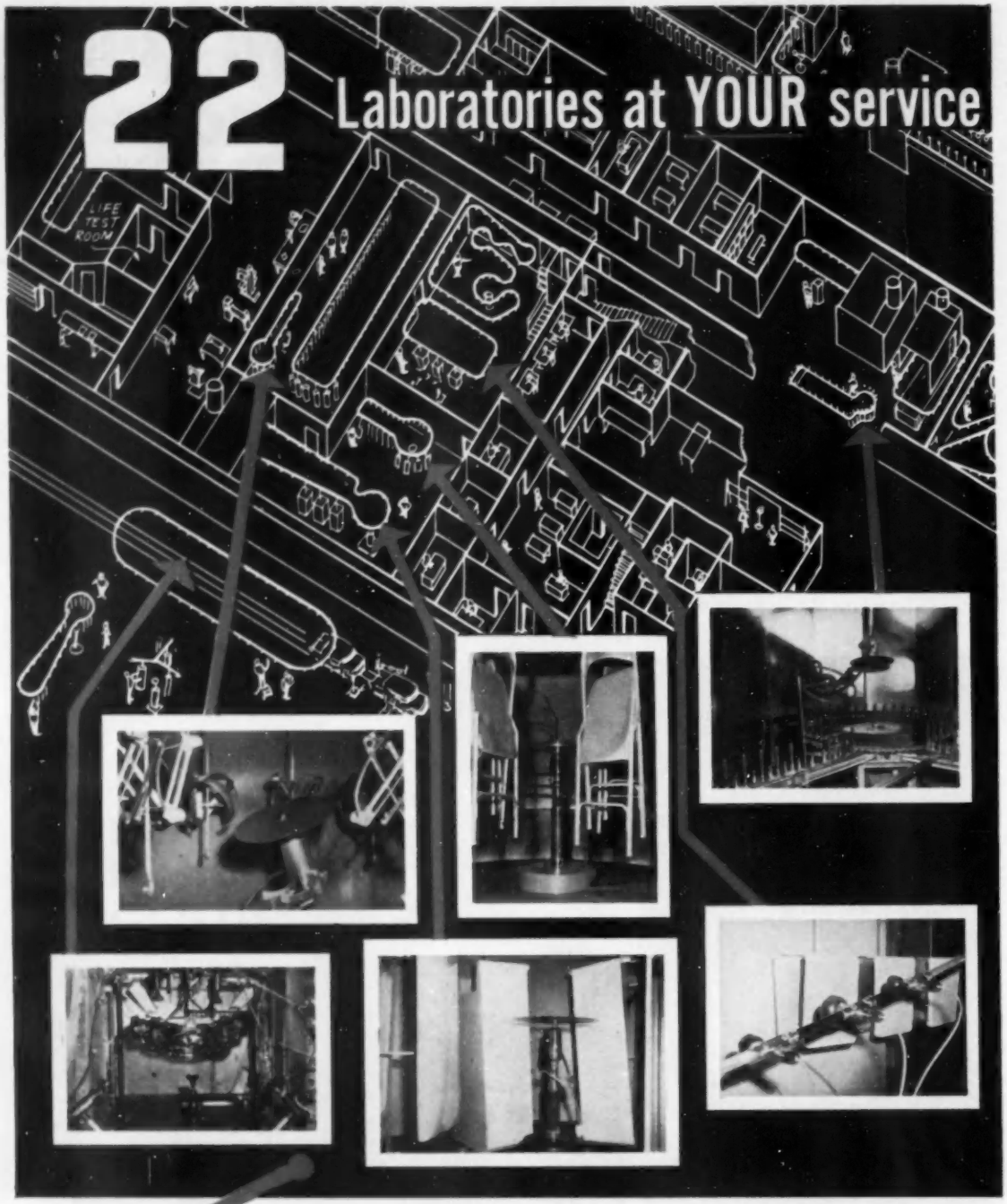
This job, while relatively simple, presented problems. To produce upwards of 700 pieces per hour, more than one drilling operation had to be performed during a working interval. Notice also that, beyond the full diameter of each of the four .204" dia. holes, the bottom of the larger central hole is "end-milled" by the .204" drill. This necessitated drill bushings located on the fixture *as close to the work as possible.* In fact, all three drills are guided by bushings to insure accuracy.

An output of 728 pieces per hour is approximately one piece delivered every 5 seconds. We provide maximum time for *loading* by *unclamping and unloading* the fixture automatically at the end of the work cycle.

When you buy a Kingsbury you acquire a custom-built machine, complete in *every* detail!

Kingsbury Machine Tool Corp.
114 Laurel Street, Keene, N. H.





YOUR JOB, LIKE THESE SHOWN ABOVE, WILL BE TEST PROVEN

under simulated production conditions to determine cost-saving benefits and other advantages. Ransburg also maintains other test facilities in Los Angeles, London, England; Bad Hersfeld, Germany; Paris, France and Sydney, Australia.

to prove the painting of YOUR products with

RANSBURG

Electrostatic Painting Processes

Let us make laboratory tests and prove the advantages and cost-saving benefits of painting YOUR products AUTOMATICALLY with one of the Ransburg Electro-Spray Processes.

GET THE FACTS . . . IT COSTS YOU NOTHING!

STEP BY STEP—HERE'S WHAT YOU GET . . .

- Survey of your plant by Ransburg's experienced field engineers, including savings estimate.
- Lab painting demonstration of your products, using equipment closely simulating your own production conditions.
- Accurate measurements of paint film thickness.
- Engineering report of detailed tests to determine paint and labor savings.
- Coated samples of your job, lab production photos, and even movies if desired.
- Detailed drawings of equipment and workholder.

All of the above without obligation to you. And, before equipment is installed you receive detailed, pre-installation instructions. Too, a well-qualified, experienced engineer supervises installation and trains your operator on the job. Ransburg offers continuing laboratory and field service to help you with any of your finishing operations.

Ransburg
ELECTRO-COATING CORP.
Indianapolis 7, Indiana

● **First,** Ransburg sales engineers will make a survey in your plant to check the possibilities of using Electrostatic Spray Painting on your products. Next, you will send samples of your unpainted products—with paint—to the Ransburg laboratories in Indianapolis.

Here, the technical staff takes over. The Ransburg Engineering staff—which includes PH.D's and Masters in Physics, Science, Electrical, Mechanical and Chemical Engineering—makes a complete study of your job. Not only do they have the necessary academic training, but they have the "know how" gained from years of actual experience in the field. Ransburg, you know, was the pioneer in Electrostatic Spray Painting 15 years ago. Engineers and well-qualified technicians have at their disposal every facility for conducting complete tests, simulating your own production conditions. They'll decide which type conveyor is best suited for your job. (There's a conveyorized lab set-up—22 in all—to handle products ranging in size from automobile bodies and chassis to small components, such as window hardware.) They'll design workholders, if necessary, and determine exactly how your job can be run to your best advantage. Details, such as fixture spacing, will be worked out too.

After preliminary studies and tests, you are invited to Indianapolis to see your job run in the lab. If you wish, photos and even movies of your test run can be made and furnished for your own production people to study. You see first-hand what Ransburg Electrostatic Spray Painting can do for you in your own plant.

YOU GET PAINT AND LABOR SAVINGS

Paint usage is accurately measured during the demonstration. The Ransburg No. 2 Process will provide savings up to five times the paint mileage of hand spray. And, one unit can do the work of many hand sprayers. You will see the improved, uniform quality of the work . . . you'll know what kind of increased production to expect, and you can recognize labor savings. ALL OF THIS WITHOUT OBLIGATION.

Ransburg service doesn't end there. After the equipment is installed in your plant—with our supervisory help—we will train your operator and continue to work with your finishing department. Our technically-trained field service engineers are always available to assist with any of your finishing problems.

Briefly, that's our story. Now it's your move. Call or write. Dept. A.

HEAVY PURCHASES AT METAL SHOW

(*Continued from page 76*)

themselves to automated procedures and to easier maintenance in addition to a host of other advantages.

Du Pont showed a new explosive type rivet for jet engine assembly. This new rivet is made of a special alloy that is capable of taking up to 1600 F. Du Pont also showed a high-amperage, low-voltage rivet tool. This tool was designed and originally built by Du Pont and has recently been taken over by Rollins Electronics. Rivets are exploded by passing a high current through the rivet by means of concentric electrodes in contact with the rivet. The equipment is designed to preheat the rivet and then expand it by increasing the current suddenly. The tool is operated by a source of 115 volts supplying up to 30 amperes. A step-down transformer is used in the circuit.

Among the latest in physical testing equipment was a completely automatic tensile machine. The machine demonstrated by Tinius Olsen, of 60,000-lb capacity, has a built-in programmer for all phases of the test cycle. An electric typewriter automatically prints the yield strength for selected percentage of offset, plus an identifying test number. Stress-strain curves are not required. The operator merely presets the control point (just short of expected yield point) and yield speed time, fast approach speed, slow yield speed and very fast tensile speed, and starts the test. Other program controllers are available for production proof testing, yield strength by extension under load method, stress cycling and crosshead cycling.

Another new Olsen development shown was an air-operated Brinell hardness tester. Connected to any 60-psi air supply, the machine applies a preset load automatically when the operator flips the test switch. Also shown was the Penetrascope, a portable device for production testing by the Vickers System.

During the show Allegheny Ludlum Steel Corp. announced the opening of a new melting department for the production of high alloy steels that offers 250,000 lb per month of high performance alloys to the metal-working industry. Company spokesmen said that the new consumable electrode vacuum melting facilities can make 10 times as much high quality superalloys, or tool steels, or high quality stainless steels in this department that has started operation in Watervliet as the whole industry has been using up to now in any given month. The department was designed so that it could be rapidly expanded to four times its present size.

Another new development disclosed during the show was the Flame-Plating process developed by Linde Air Products Co. A sound, color slide film described and illustrated this new method of applying particles of tungsten carbide to the surface of a workpiece.

This is accomplished through the use of a specially constructed gun which consists of a barrel and a mechanism for loading precise quantities of tungsten carbide powder, acetylene and oxygen into the firing chamber. A spark ignites the mixture

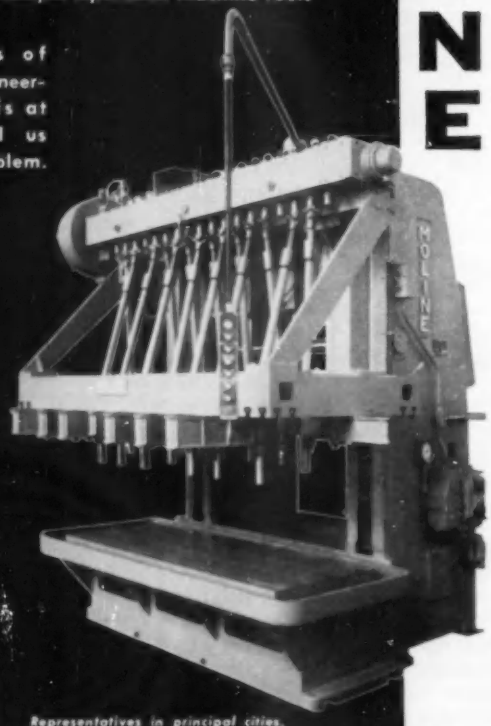
FOR GREATER . . .
PRODUCTION • EFFICIENCY • SAVINGS

Use an individually designed "Hole-Hog" Machine Tool for such jobs as:

- Multi-Spindle Boring
- Single and Multi-Spindle Honing
- Straight Line Multi-Drilling
- Adjustable Spindle Drilling
- Vertical and Way-Type Fixed Center Drilling, Boring and Tapping
- Special Multiple Operation Machine Tools

Over 50 years of Machine Tool Engineering experience is at your service. Tell us your particular problem.

MOLINE



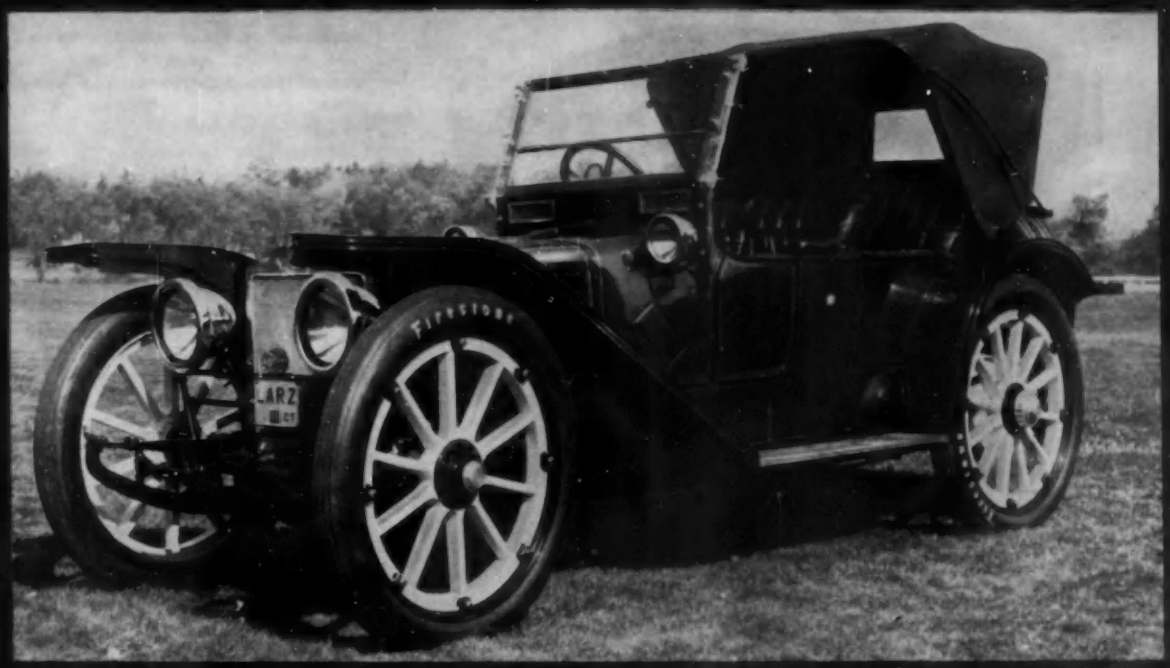
HU68 drilling machine with fourteen spindles adjustable in a 72 inch by 24 inch drilling area. Other sizes available.

MOLINE TOOL CO. HOLE-HOG MOLINE, ILLINOIS

Representatives in principal cities.

102

MOLINE TOOL COMPANY
100 20TH STREET MOLINE, ILLINOIS



Send For Free Print—1910 American Underslung

Directly opposite normal practice, the 1910 American Underslung featured a frame slung beneath the axles. With excellent road-holding capacities, it had a four-speed sliding-gear transmission, Bosch magneto ignition, and a 22-gallon fuel capacity.

This is one of a series of antique automobile prints that will appear in future Morse advertisements. Write for your free copy of this print, suitable for framing. Morse Chain Company, Ithaca, New York.

60,000,000 Timing Chains— and growing every year!

Since the day when the first "horseless carriage" raced along at the breakneck speed of 10 miles per hour, Morse has supplied the auto industry with over 60,000,000 Timing Chain Drives. In fact, of the seventeen automobile manufacturers who use Timing Chains as original equipment, *thirteen* specify Morse.

Precision-built Morse Timing Chain Drives give longer service life and relative freedom from maintenance. They operate safely, quietly, and smoothly—with positive timing.

Check into Morse Timing Chain Drives, and other Power Transmission Products manufactured by Morse. We have expert engineers available to help you in your power transmission needs. Write today for quick assistance on your problem.

MORSE CHAIN COMPANY
ITHACA, NEW YORK

MORSE BW **CHAINS, CLUTCHES, AND COUPLINGS**

T-J SPEED

IN RIVETING and CLINCHING

REDUCES LABOR COSTS!

T-J RIVITOR . . .

8" throat . . . feeds and sets rivets with special 10 station indexing fixture. Has air operated hold down mechanism and special air circuit to provide automatic indexing.

T-J CLINCHOR . . .

one of six special 8" throat Underfeed Clinchors used by a large automotive body manufacturer. Feeds and sets square cased nuts in outside quarter panels, left and right hand.

AUTOMATIC FEEDING and SETTING

More and more . . . T-J Rivitors and Clinchors meet today's demands for faster assembly on a wide range of jobs . . . in aircraft, automotive, farm machinery, stampings of all kinds.

T-J CLINCHORS set clinch nuts with fully automatic operation, controlled by a single foot pedal. Available in Underfeed and Gravity feed models, throat depths 8" to 36".

T-J RIVITORS automatically feed and set solid rivets with high production. Electrically powered Rivitor sets solid steel rivets up to ⅞" long. Air-powered sets aluminum alloy rivets or steel rivets up to ¾" long. Throat depths 8" to 36".

Write for Clinchor bulletin 847; Rivitor bulletins 646 and 847. The Tomkins-Johnson Co., Jackson, Mich.

T-J

TOMKINS-JOHNSON

RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

38 YEARS EXPERIENCE

producing heat and pressure waves. The confining shape of the barrel concentrates these waves in a small area producing a tremendous heat and pressure build up.

When the temperature reaches 6000 F., the heat waves begin to move faster than the pressure waves. The heat wave, also known as the detonation wave, rips through the gas and powder mixture at 10 times the speed of sound, completely burning the gases and leaving behind a solid block of pressure in which the tungsten carbide powder is suspended. Pressure inside the barrel reaches 10,000 psi in 0.003 second. When the detonation wave leaves the muzzle of the gun, it turns into a shock wave and dissipates into the air. The gases burst out carrying the tungsten carbide powder with them. The particles of tungsten carbide become partially molten and are hurled at 9000 fps at the workpiece. As blast after blast hits the surface of the part, the particles build-up and fuse together until the desired thickness is obtained.

The experimental cemented oxide tool material developed by Carboloy Department of General Electric Co. will be available to users on a limited basis by Jan. 1. This was revealed at the show during a "baby" seminar attended by the nation's business press. According to Carboloy engineers conducting the seminar, initial spot tests of the new cemented oxide material—so called to distinguish it from typical ceramics—indicated that it may be used with good success for finishing operations at top speed ranges of current machines in use. Its performance, however, is considerably better at speeds of 1000 sfpm and over. Wear resistance of the new material is said to be such that on some tests it indicated a tool life of considerably more than 25 to 1 over carbides employed. For finishing cuts, the material is expected to reduce cutting time drastically — taking up where carbides leave off at super high speed machining ranges.

The International Nickel Co. displayed, among its other products, platinum metals (platinum, palladium, rhodium, ruthenium and iridium) which are recovered during refining of copper and nickel, the company's primary products. International Nickel produces these metals in the form of high purity sponge and, while many tons of ore are processed to recover a single ounce of platinum metals concentrate, the company's extensive operations have made Canada one of the most im-

THE NUMBER FOR SATURDAY...

134

Numbers aren't emotional or animated.

People are emetional, lovable and very animated.

Number 134 is a statistic. It says 134 people will die in auto accidents this Saturday. It doesn't say

Who Dies or
Where They Die

it only says *will* die.

The certainty of it is frightening.

When you get behind the wheel of your car this Saturday, remember . . . 134 is your enemy. Don't contribute to its success by being inconsiderate on the road. You have everything to gain by being courteous and careful . . . and the lives of the animated innocents to lose by being careless.

There's a number for every day of the week (average figures for automobile fatalities) . . .

134 is the number for Saturday,
115 is the number for Sunday,
70 is the number for Monday, Tuesday and Wednesday,
83 is the number for Thursday, and
95 is the number for Friday.

These numbers are your enemies. Fight them every day of the week. The next time you pull out to pass a car on a curve or on a hill, *think of the number*. Every time you're in a hurry and press heavily on the accelerator . . . *think of the number*. Every time you get behind the wheel . . . there's a number for that day. When you're careless on the road, you're risking a bad trade—your name for a number.

National safety groups, automobile manufacturers and automotive suppliers are all constantly striving to reduce accidents and make driving safer and more pleasant.

One of these suppliers, Auto Specialties Mfg. Co., Inc., of Saint Joseph, Michigan, has developed safer brakes for today's more powerful cars: Auto Specialties Double-Disc Brakes. These brakes, designed on an entirely different principle, have passed the severe braking tests of the leading car factories. Auto Specialties Double-Disc Brakes make driving safer, make drivers surer of their brakes. Their adoption will be in keeping with the automotive industries' aim for safer and safer driving.

A 16-page, 4-color book, "The Stopping Story," gives detailed information about these brakes. It's free. Write for it to

AUTO SPECIALTIES MFG. CO., INC.

SAINT JOSEPH, MICHIGAN

Plants also at Benton Harbor and Hartford, Michigan
and Windsor, Ontario, Canada

Manufacturing for the automotive and farm machinery industry since 1908

portant factors in the world production of these rare and precious metals.

Strides being made in assembly using automatic stud welding were pointed out at the Graham Manufacturing Corp. booth. In addition to the type X-8000 automatic hopper fed machine, company engineers are showing samples of thin aluminum sheet with vinyl coating to which studs were welded without showing through.

Vickers Electric Div. displayed its true magnetic amplifier-controlled d-c welder, which is just going into nationwide distribution. Among its features are a low open circuit voltage of 72 to 40 volts.

A scanning device for most economical airless painting was demonstrated at the exhibit of Bede Products Corp. The device uses a magnetic tape to control operation of the spray gun. The control can prerecord the shape of items coming down the line ahead of the gun, and turn on the gun at the proper moment when the part actually reaches the paint area. Another type of control uses a copper engraving with a predetermined pattern, to paint such items as two-tone fenders without masking tape.

A new aluminum conversion coating process to specification MIL-C-5541 was in operation at the Turco Products exhibit. Not electrolytic, the process provides a base for paint or decorative coatings and was shown to be non-smearing. Among new uses for Bakelite epoxy resins, shown at the Union Carbide & Carbon Corp. display, was a one-piece, one-third scale model of a 1956 convertible Pontiac to be used for dealer promotion activities. Also shown were housings for machine tools as developed by Gisholt and Rezolin. A sealing compound for porous metal castings for aircraft engines were shown as used by Lycoming Div. to reduce processing time from eight to five hours. At the Gasaway Corp. exhibit of vinyl roll coating on sheet metal, discussion revealed that fabricators of this material are working on applications including automotive kick plates and other parts.

New air devices demonstrated by Modernaire Corp. included a single acting cylinder which reuses the air for the return stroke, eliminating the need for a spring return. Other devices included air clamps with one, two and three-inch bore and one, two and three-inch for each bore size, as well as a one-inch air valve for all models, the firm's largest to date.

Check your Assemblies

for spots that can use low-cost

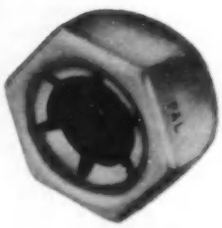
ACORN TYPE

PALNUT LOCK NUTS

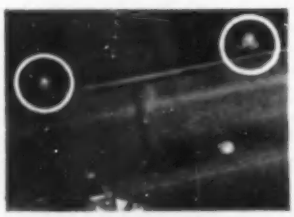
TRADE MARK

You'll gain these advantages!

- **Smart appearance** Rough, unsightly bolt ends are covered.
- **Passenger safety** No scratching of hands or arms. No catching of clothes or polishing cloth.
- **Vibration-proof fastening** provided by PALNUT resilient spring locking action.
- **Easy, speedy assembly** with power tools. Extra-fast assembly with specially-designed PALNUT magnetic sockets.
- **Big savings** Acorn PALNUTS cost much less than machined types, need no lockwashers to prevent loosening.



Full range of sizes for 6-32, 8-32, 10-32, 10-24, ¼-20 and 5/16-18 bolts. Choice of plain steel, parkerized or Cadmium finishes.



Glove compartment with Acorn PALNUTS installed to securely fasten compartment, while covering bolt ends to protect hands from scratching.

SEND FOR FREE SAMPLES
stating type, size and application

***Also*—SEMI-ACORN STYLE**
with prevailing torque

Turned-in top exerts additional grip which holds anywhere on threads, for use as an adjusting nut. Also used as load-carrying lock nut when seated, giving acorn effect without need of critical bolt lengths.

THE PALNUT COMPANY
60 Cordier St., Irvington 11, N. J.

Regional sales office:
730 West Eight Mile Road, Detroit 20, Mich.

BOOKS . . .

A GENERAL THEORY OF ECONOMIC PROCESS, *by Neil W. Chamberlain, published by Harper & Bros., 49 E. 33rd St., New York 16, N. Y. Price, $5.00.* Here is a fresh approach to economic theory, and one which should interest both social scientists—economists, political scientists, and sociologists—and businessmen. Among the more important features of the book are: (1) its focus on income flows at micro and well as macro levels; (2) its treatment of bargaining power as the basis for changes in micro and macro flows; (3) its incorporation of organizational theory in the analysis of the principal units for the flow of funds—households, firms, governmental units; (4) its incorporation of direct political influences on income flows; (5) its utilization of sociological theory in developing the importance of symbiotic as well as commensal competition in economic life. The author's analysis does not attempt to displace current theory, but rather to integrate previously unrelated concepts into a single interdisciplinary system.

AUTOMOTIVE INDUSTRIES KEEPS YOU INFORMED

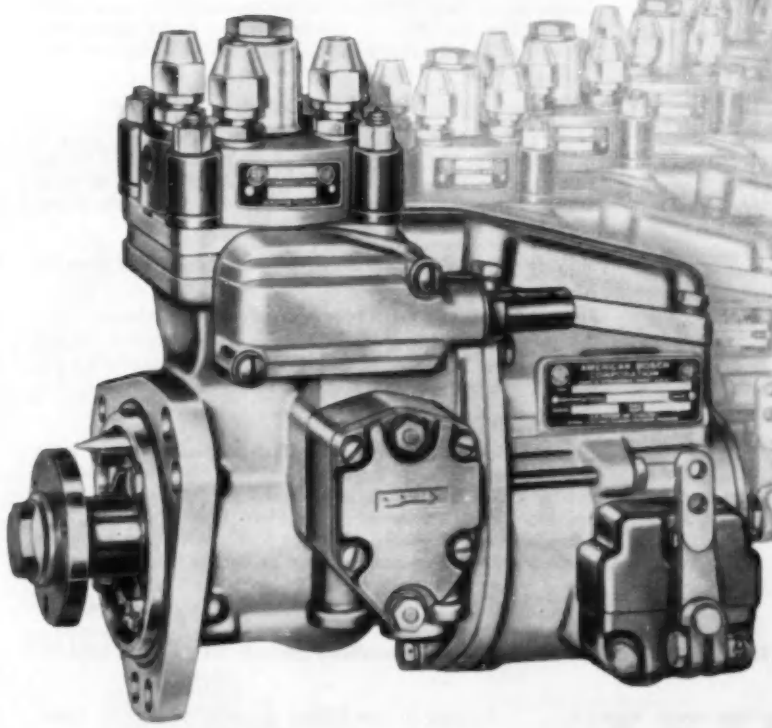
over 100,000...and STILL GROWING

Now over 100,000 American Bosch PSB injection pumps have been produced for the Diesel Industry.

This record, established in the space of just a few years, proves conclusively the wide acceptance of this simplified, distributor type pump.

Today, more Diesel engine manufacturers than ever before are using the American Bosch PSB as standard equipment on the smaller Diesels that power farm tractors, compressors, generating sets, boats and trucks in ever-increasing numbers.

The American Bosch PSB has an outstanding record of performance and dependability—assuring users everywhere of long trouble-free service and low maintenance expense. It stands as a significent contribution to the progress of the Diesel engine. American Bosch, Springfield 7, Massachusetts.



AMERICAN BOSCH

NOW SAVE 36% on Installation Time

with IMPERIAL Hi-Duty® TUBE FITTINGS

Furnished in Brass and Aluminum

Just Push Tube Into Fitting Without Removing Nut

The sleeve on Hi-Duty Fittings shears off during assembly and becomes permanently attached to tube. Fitting will make repeated tight reconnections.

For Tubing ⅛" to 1" O.D.

Ask for Bulletin No. 3002

Compared to COMPRESSION FITTINGS

Repeated, thorough tests under field conditions reveal that Imperial Hi-Duty Fittings can be assembled in an average time of 13.2 seconds . . . whereas regular compression type fittings take an average of *20.8* seconds. This is a *36%* saving in time . . . and precious labor.

Compared to FLARED FITTINGS

Here the savings in time are even more striking since it takes *45* seconds on the average to install a flare fitting compared to 13.2 for Hi-Duty . . . a saving of *71%* in time. A man can assemble better than *3* Hi-Duty Fittings in the time it takes to assemble 1 flare fitting.

Why is the HI-DUTY FITTING so much Easier and Quicker to Assemble?

Fitting furnished with integrated nut and sleeve

To get a tight joint, simply insert tube into fitting and tighten nut. No loose sleeve to drop . . . no flaring required. Makes repeated tight reconnections.

MAKES STRONGER JOINTS

Because sleeve is always in perfect alignment when joint is made and because its design minimizes deformation of tubing, Hi-Duty Fittings assure stronger joints that remain leakproof even under severe service. Tests show Hi-Duty joints will stand over 5 times as much vibration as joints made with ordinary compression or flare fittings.

Average Time Required to Assemble Fittings

Type of Fitting	Average Time Each Joint	Joints per Hour
HI-DUTY	13.2 sec.	274
Regular Compression	20.8 sec.	173
Flare	45 sec.	80

THE IMPERIAL BRASS MANUFACTURING COMPANY, 1241 W. Harrison Street, Chicago 7, Illinois

IMPERIAL

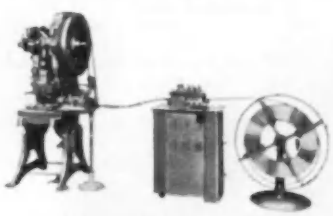
Pioneers in Tube Fittings and Tube Working Tools

Emblem of Quality

FLEXIBILITY
in Stock Straightening

WITTEK
STOCK STRAIGHTENERS

Used in conjunction with a reel stand and automatic feed for punch presses, the Wittek Stock Straightener is a self-contained, motor-driven unit designed for maximum efficiency in the continuous straightening of coiled stock. Standard models handle stock with widths up to 12 inches. An infinitely variable speed drive permits any desired straightening speed so that the proper slack is maintained in the straightened strip between the unit and the press feed.



This typical Wittek automatic production feeding setup includes—Wittek roll feed mounted on the punch press, Wittek stock straightener, and Wittek self-centering reel stand.

Write for full particulars

WITTEK Manufacturing Co.

Production Feeding Equipment

4319 W. 24th Place • Chicago 23, Illinois

New Defense Facilities

SUPPLEMENTING the list of Certificates of Necessity issued up to Aug. 24, authorizing new or expanded defense plant facilities for the manufacture of automotive and aviation war goods which was published in the Oct. 15 issue, page 144 of AUTOMOTIVE INDUSTRIES, the following additional certificates were announced by the Office of Defense Mobilization, covering the period which extends from Sept. 8 to Oct. 19, inclusive.

The figure appearing in parentheses is the percentage authorized in respect to actual fast tax write-offs.

ALLEGHENY LUDLUM STEEL CORP., Dunkirk, New York
Titanium processing facilities—$397,000 (65)

ALLEGHENY LUDLUM STEEL CORP., Watervliet, New York
Titanium processing facilities—$307,000 (65)

ALLEGHENY LUDLUM STEEL CORP., Brackenridge, Pa.
Research and development facilities—$189,000 (65)
Titanium processing facilities—$1,590,000 (75)

BELL AIRCRAFT CORP., Wheatfield, Niagara Co., New York
Military aircraft—$132,774 (65)

BENDIX AVIATION CORP., Pacific Div., North Hollywood, Calif.
Aircraft components—$83,126 (65)

CURTISS-WRIGHT CORP., Wright Aeronautical Div., Wood-Ridge, N. J.
Military aircraft engines—$324,513 (65)

THE DOW CHEMICAL COMPANY, Midland, Mich.
Research and development facilities—$1,044,800 (40); $380,623 (65)

EX-CELL-O CORPORATION, Highland Park, Mich.
Aircraft parts—$146,287 (65)

FAIRCHILD ENGINE AND AIRPLANE CORP., Stratos Div., Bay Shore, L. I., New York
Aircraft parts—$85,305 (65)

GLOBE INDUSTRIES, INC., Dayton, Ohio
Electric motors for military aircraft—$150,000 (45)

LORD MANUFACTURING CO., Erie, Pa.
Aircraft engine parts—$97,427 (65)
Military aircraft parts—$88,860 (70)

THE OLIVER CORPORATION, York, Pa.
Ordnance—$113,656 (65)

PACIFIC MERCURY TELEVISION MFG. Corp., Joplin, Missouri
Military aircraft parts—$302,180 (65)

PARKER AIRCRAFT COMPANY, Los Angeles, Calif.
Aircraft parts—$221,150 (70)

THE RAYN AERONAUTICAL CO., San Diego, Calif.
Aircraft components—$13,792 (65)
Military aircraft assemblies—$140,000 (60)
Aircraft parts—$50,000 (60)

SOUTHWEST AIRMOTIVE EQUIPMENT CO., Dallas, Texas
Military engine overhaul facilities—$580,388 (60)

(Turn to page 202, please)

NEW LUBER-FINER INDUSTRIAL MODELS ANNOUNCED

Luber-finer

MODELS 272-C & 363-C FOR MOBILE STATIONARY & MARINE ENGINES
With up to 3 & 4 Gal. Crankcase Capacities

NOTE: All Luber-finer Models may be used on engines larger than recommended; however, the Pack life will be proportionately shorter.

CHECK ALL THESE EXCLUSIVE LUBER-FINER FEATURES

- ***SINGLE BOLT CLOSURE*** — Ingeniously designed Clamping Ring utilizes Single Bolt Closure for quick, easy Pack Replacement.
- ***POSITIVE SEALING GASKET*** — Long-lasting "O" ring type gasket assures leak-proof lid closure at all operating pressures.
- ***POSITIVE PACK SEAL*** — An outstanding feature that eliminates the possibility of oil ever by-passing the Luber-finer pack.
- ***DUAL SAFETY VALVES*** — Prevents oil drain-back, assuring exact crankcase oil level reading at all times, stops oil from circulating through unit if lines are reversed or if the Luber-finer Unit is otherwise improperly installed.

Luber-finer Units are Standard and Optional Equipment on America's Leading Diesel Trucks, Tractors and Stationary Engines

AND DON'T FORGET!
For Luber-finer's Engineered Protection — Be Sure There is a Genuine
LUBER-FINER PACK INSIDE!

Only a Luber-finer Unit plus a Genuine Luber-finer Pack can give you the Exclusive Patented Filtering Process that has made Luber-finer the Standard of the Industry since 1936!

For Complete Information Write Dept. 41

LUBER-FINER, INC.
2514 S. Grand Ave., Los Angeles 7

(*Continued from page* 201)

SUNDSTRAND MACHINE TOOL COMPANY, Rockford, Ill.
Military aircraft components—$281,000 (45)

UNITED AIRCRAFT CORP., Hamilton Standard Div., Windsor Locks, Conn.
Military aircraft components—$197,123 (65)

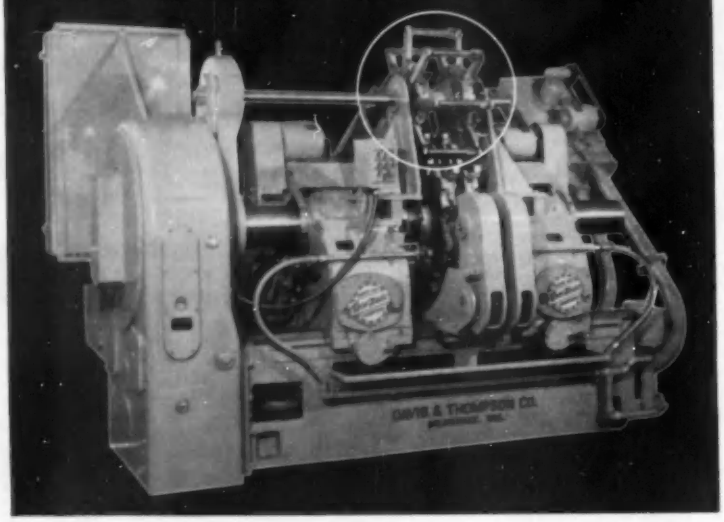
UNITED AIRCRAFT CORP., Pratt & Whitney Aircraft Div., East Hartford, Conn.
Military aircraft engines — $1,712,000 (65)

UNITED STATES STEEL CORP., Homestead, Pa.
Special forgings for military end items —$4,707,000 (65)

More Government Contract Awards

THIS latest list of Government prime contracts that have been awarded covers the period from Sept. 28 to Oct. 30, 1955. Items included in this list are for various types of automotive military equipment, including tanks, motorized gun carriages, trucks, airplanes, automotive components and spare parts, automotive maintenance equipment, etc.

...Milling and Centering Steering Gear Shafts at the Rate of 360 Per Hour



This continuous type milling and centering machine has been furnished with an automatic unloader (indicated by circle) which transfers finished parts onto a conveyor or discharge chute. Milling and centering of both ends is done simultaneously and in continuous production.

Basically, this is a standard ROTO-MATIC machine tooled-up to handle special production requirements. Rough and finish milling and centering spindles in both heads have micrometer endwise adjustment. Heads are adjustable on the ways. With equalizing jaws in fixtures plus chain clamping, machine is fully automatic.

If you have work of this nature, consult D&T engineering for further details.

Roto-Matic

Davis and Thompson Co.

4480 N. 124th ST. MILWAUKEE 10, WISCONSIN

ALCO PRODUCTS, INC., New York, N. Y.
Control panel, pump, engine and injector—5 ea.—$44,947

BEECH AIRCRAFT CORP., Wichita, Kansas
Modification of aircraft transmission assemblies—$46,152

BELL AIRCRAFT CORP., Buffalo, New York
Overhaul, repair and/or modification of components and related equipment of GAM-63 weapons system—$277,154

BENDIX AVIATION CORP., Bendix Products Div., South Bend, Ind.
Services and repair parts for Bendix Pumps—Various—$723,766
Arm assys and maintenance parts—Various—$159,198
Actuators and brace assys. and maintenance parts—Various—$91,834
Wheel and brake assemblies—Various—$49,099
Assemblies for various aircraft—Various—$176,442
Engine parts for R2800-50 P&W engines—Various—$51,603

BENDIX AVIATION CORP., Utica Div., Utica, New York
Generator drive assys.—Various—$174,487

CHANCE-VOUGHT AIRCRAFT, INC., Dallas, Texas
Maintenance parts used on various aircraft—Various—$30,354

THE CLEVELAND PNEUMATIC TOOL CO., Cleveland, Ohio
Struts for AJ-1, 2, 2P aircraft—Various—$27,846

CONTINENTAL MOTORS CORP., Muskegon, Michigan
Engine spare parts—3634 ea.—$166,372
Tank engine spare parts—1488 ea.—$26,139

CURTISS-WRIGHT CORP., Caldwell, New Jersey
Modification kits for propellers—$1,460,026
Propeller assys., spinner assys., synchronizer assys.—360—$5,705,326

DOUGLAS AIRCRAFT COMPANY, INC., Santa Monica, Calif.
Services, parts, materials—92 ea.—$112,700

ELECTRO MECHANICAL PRODUCTS CO., Garden City, Mich.
Tank spare parts—1295 ea.—$277,260

FARGO MOTOR CORP., Washington, D. C.
Trucks—53—$115,859

FLETTNER AIRCRAFT CORP., Kew Gardens, New York
Feasibility study of bench testing of helicopter transmission—Job—$37,897

FOOD MACHINERY AND CHEMICAL CORP., San Jose, Calif.
Vehicle, armored, infantry, tracked T59—300 ea.—$8,704,800

FORD MOTOR CO., Ford Div., Washington, D. C.
Trucks—19—$38,303
Automobiles—178 ea.—$228,581

FORD MOTOR CO., New York, N. Y.
Trucks—6 ea.—$21,529

THE GARRETT CORP., AiResearch Mfg. Co. Div., Phoenix, Ariz.
Modification of gas turbine power units—$133,221

GENERAL ELECTRIC CO., Philadelphia, Pa.
Repair parts for turbines—3337 ea.—$89,949

(*Turn to page* 206, *please*)

Harvey extrusions . . . saving time, weight and material for America's defense

Once, the only way to make longerons—the vital lengthwise structural members of an aircraft fuselage—was to fabricate them piece by piece from small extrusions, weldments, and hundreds of rivets. Thousands of man-hours were spent in the assembly of the longerons for each plane.

Harvey saves those wasted man-hours! A one-piece *heavy-end or stepped* extrusion is machined to final shape . . . is ready to install in the plane in a fraction of the time it once took to cut, drill, and rivet all the parts you see above . . . and the part is lighter and stronger than the built-up version.

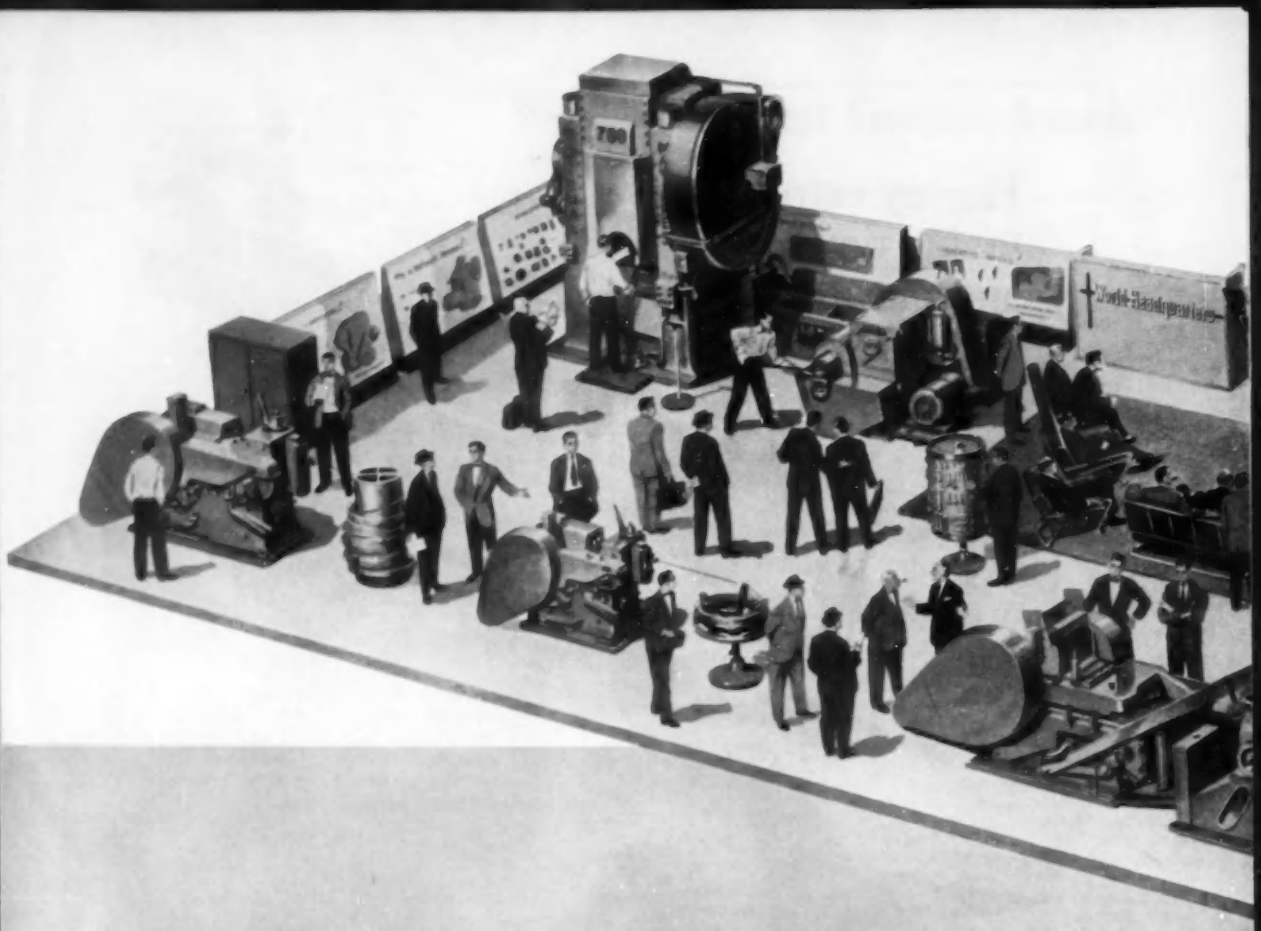
MAKING THE MOST OF ALUMINUM . . . FOR EVERYONE

HARVEY Aluminum

RESEARCH . . . DEVELOPMENT . . . PRODUCTION

Harvey does all three as a leading independent producer of aluminum extrusions in all alloys and all sizes, special extrusions, press forgings, hollow sections, structurals, rod and bar, forging stock, pipe, tubes, impact extrusions, aluminum screw machine products and related products. Also similar products in alloy steel and titanium on application.

HARVEY ALUMINUM SALES, INC., TORRANCE, CALIFORNIA—BRANCH OFFICES IN PRINCIPAL CITIES



Working with You in Forging Is Our Year-Around Job!

We sincerely thank the metalworking industry for its interest in our exhibit at the Machine Tool Show in Chicago (illustration above).

More helpful to industry, however, than this exhibit of forging equipment, is National's own "show" which is going on constantly at the plant in Tiffin, Ohio.

Our entire organization and our years of experience are here to help you "flow metal"—hot or cold, automatically or manually, routine or unusual.

We would like to welcome you at our "World Headquarters for Forging Engineering"—where tomorrow's better ways of producing metal parts are already being tested today.

NATIONAL
MACHINERY COMPANY

TIFFIN, OHIO — SINCE 1874

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS • BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS

Hartford Detroit Chicago

Be Certain WITH "SERV-RITE"

THERMOCOUPLE INSULATORS

This Gordon Thermocouple Insulator, heated red hot and plunged into cold water, came out just as good as new

Available only through GORDON, Serv-rite Thermocouple Insulators are made to stand the gaff of excessive thermal shock far above normal requirements.

For sturdy and reliable thermocouple insulator performance to meet peak production needs—specify Serv-rite . . . a development backed by Gordon's many years' experience in supplying industry with insulators that give longer life and better results.

Serv-rite Thermocouple Insulators — in any type or size — can be supplied immediately from Gordon's large stocks in the Chicago and Cleveland plants. Remember — you can always distinguish Serv-rite Insulators by their tan color.

Fish Spine Beads	Asbestos String
Asbestos Tubing	Single Hole
Double Hole Round	Double Hole Oval

GORDON SERVICE

CLAUD S. GORDON CO.

Manufacturers & Distributors

Thermocouple Supplies • Industrial Furnaces & Ovens
Pyrometers & Controls • Metallurgical Testing Machines
601 West 30th Street, Chicago 16, Illinois
2037 Hamilton Avenue, Cleveland 14, Ohio

(*Continued from page* 202)

GENERAL MOTORS CORP., Aeroproducts Div., Dayton, Ohio
Modification kits for propellers—$707,625

GENERAL MOTORS CORP., Chevrolet Motor Div., Detroit, Mich.
Trucks—335 ea.—$392,959
Automobiles—14 ea.—$19,182

GENERAL MOTORS CORP., Cleveland Diesel Engine Div., San Francisco, Calif.
Liner cylinder—142 ea.—$38,340

GENERAL MOTORS CORP., Foreign Dist. Div., New York, N. Y.
Trucks—22 ea.—$39,781

THE GENERAL TIRE AND RUBBER CO., Akron, Ohio
Brake assys.—$76,875

THE GOODYEAR TIRE & RUBBER CO., Akron, Ohio
Wheel assys.—606—$547,689

HALL-SCOTT MOTORS CO., Berkeley, Calif.
Repair parts for gasoline engines—3649 ea.—$141,870

HARVEY MACHINE COMPANY, INC., Torrance, Calif.
Development of two-in. rocket motor parts manufacture—Job—$150,000

HOLLEY CARBURETOR CO., Van Dyke, Mich.
Carburetor spare parts—4272 ea.—$27,426
Maintenance parts—Various—$214,035

JACK & HEINTZ, INC., Cleveland, Ohio
Generators, aircraft engine driven, 30 volt, d-c, 400 amp—$61,274

THE LEECE-NEVILLE CO., Cleveland, Ohio
Repairs parts for starting motors—1549 ea.—$43,687

LOCKHEED AIRCRAFT CORP., Burbank, Calif.
T-33A aircraft and supporting spare parts, special tools and GHE—$6,936,708

LOCKHEED AIRCRAFT CORP., Marietta, Georgia
Facilities for production of C-130 aircraft—$226,688
C-130A aircraft—$25,000,000
KC-X advance jet tanker—$500,000

McDONNELL AIRCRAFT CORP., St. Louis, Missouri
Maintenance parts for F2H aircraft—Various—$555,153

GLENN L. MARTIN CO., Baltimore, Maryland
Modification and inspection of aircraft—$1,600,000
Modification of TM-61 test equipment and spares—$134,622
Repair, modification, etc., of TM-61 missiles and components—$116,114

NILES-BEMENT-POND CO., Chandler Evans Div., West Hartford, Conn.
Maintenance parts used on carburetors —Various—$62,512

NORTH AMERICAN AVIATION, INC., Los Angeles, Calif.
F-86F airplanes, components, assemblies, parts and related equipment—$9,000,000

NORTH AMERICAN AVIATION, INC., Columbus Div., Columbus, Ohio
Maintenance parts for AJ aircraft—Various—$99,737

NORTHROP AIRCRAFT, INC., Anaheim, Calif.
Product correction program on T46E1 and XT31 program—Job—$45,167

PARKER AIRCRAFT COMPANY, Los Angeles, Calif.
Fuel valves—Various—$30,659

REO MOTORS, INC., Lansing, Michigan
Muffler assembly—19,886 ea.—$120,708

Universal SPECIAL CS SHAFT TYPE OIL SEAL

WITH 8 BIG ADVANTAGES

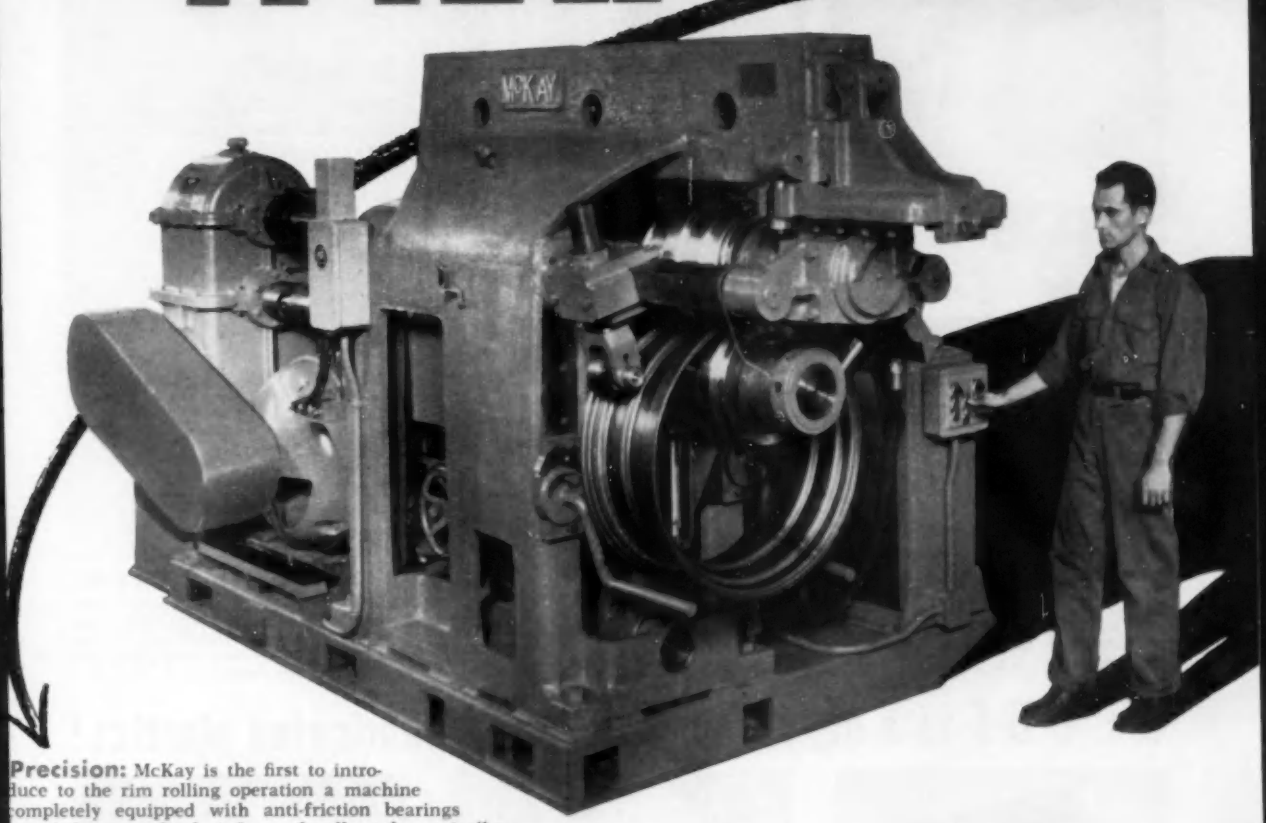
- High speeds improve efficiency.
- Low friction.
- Long, trouble-free life.
- Ideal for high operating temperatures.
- Permits greater shaft eccentricity.
- Unaffected by sudden acceleration.
- No replacement problems.
- Nominal cost.

WRITE FOR DESCRIPTIVE LITERATURE

UNIVERSAL OIL SEAL CO. P.O. BOX 74 PONTIAC, MICHIGAN

4 REASONS Why Wheel Manufacturers Specify

McKAY RIM ROLLERS



Precision: McKay is the first to introduce to the rim rolling operation a machine completely equipped with anti-friction bearings permitting more load at the work rolls and practically eliminating maintenance.

Precision setup of work roll shafts is accomplished either manually or by motor-operated screw adjustment of toggles, permitting the exceptional accuracy needed for the production of rims for tubeless tires.

Ruggedness: A one-piece, cast steel housing absorbs all work loads. A 2-Hi, oil-tight gear case drives both work roll shafts through husky universal spindles providing quiet trouble-free operation.

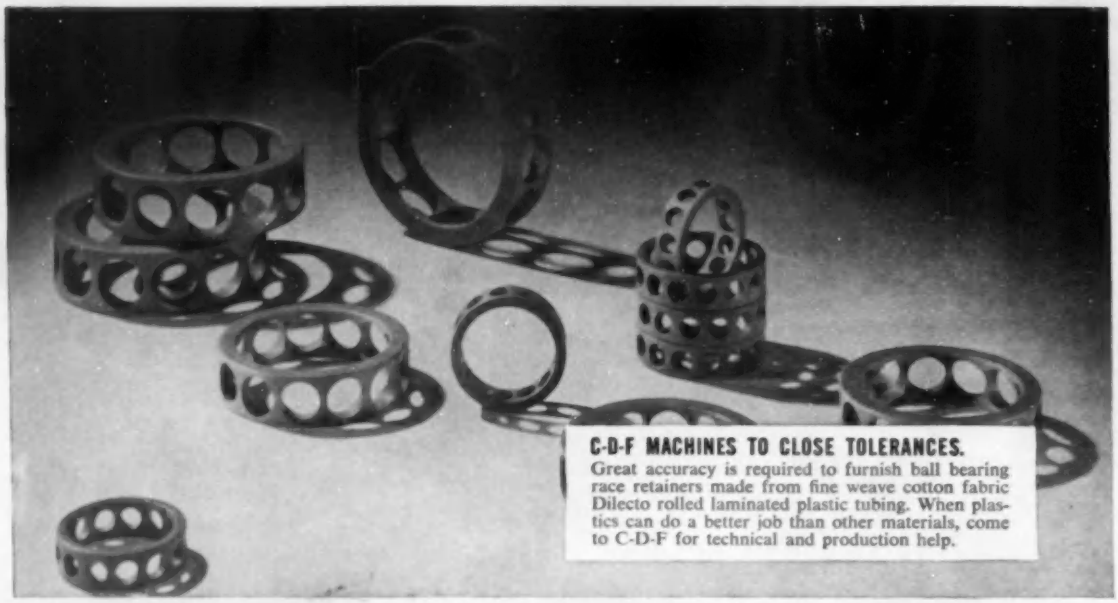
Performance: Accurate, repetitive cycling is assured by solenoid-controlled hydraulic four-way and flow control valves. An electric timer determines the dwell period of the rim rollers under full load at full depth.

Compact Design: All equipment is mounted on a single base, including the hydraulic power unit and valve panel as well as the electrical equipment and controls. Only 70 square feet of floor space required. A simple connection to your power source and you're in business.

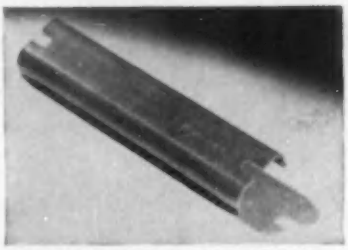
ENGINEERS AND DESIGNERS OF
EQUIPMENT FOR THE AUTOMOTIVE,
FABRICATING AND STEEL INDUSTRIES

McK

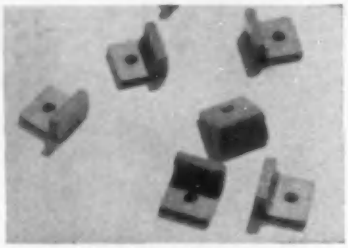
The McKAY MACHINE *Company*
YOUNGSTOWN, OHIO



C-D-F MACHINES TO CLOSE TOLERANCES. Great accuracy is required to furnish ball bearing race retainers made from fine weave cotton fabric Dilecto rolled laminated plastic tubing. When plastics can do a better job than other materials, come to C-D-F for technical and production help.



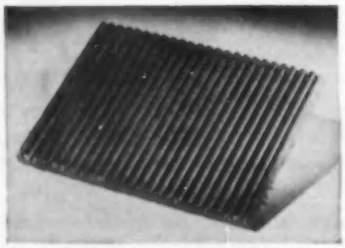
C-D-F PIONEERED IN POST-FORMING of laminated plastics. This technique gives you stronger, more versatile insulating parts with lower costs. This aircraft channel strip is an example of simple post-forming.



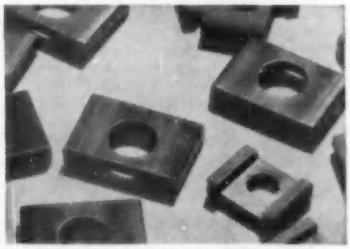
C-D-F DOES THE UNUSUAL. These rubbing blocks are made from fine-weave cotton cloth Dilecto molded *tubing* that has been pierced and cut. The part gains in mechanical strength — the product gets longer service life.

C-D-F SPECIALIZES IN AUTOMATIC SCREW MACHINING of plastic components. These breaker arm bushings are made from Dilecto paper base rolled tubing on high speed machines by men who know and use cost saving methods.

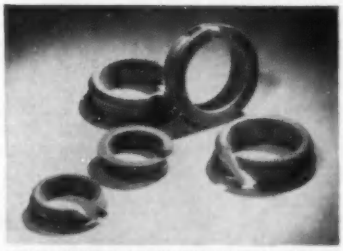
Yes, C-D-F is a big reliable source for fabricated plastics!



C-D-F SERVES MANY INDUSTRIES with fabricated specialties. A great amount is concentrated in the automotive and allied fields. This aircraft part has a corrugated surface on a strong woven asbestos laminated base.



C-D-F IS A PUNCHING SPECIALIST on these starter solenoid insulators. This is XX-26 Dilecto molded channel strip, pierced and punched to length. Special C-D-F punching grades give you lower costs, faster assembly, fewer rejects.



C-D-F COMES UP WITH THE ANSWERS to insulating problems. These unique snap-in grommets are easy to insert, spring out and hold tight. Write for samples. The chances are that C-D-F is already making the answer to your problem.

See our general catalog in Sweet's Design File for more technical data, the address and telephone number of your nearest C-D-F sales engineer. Also, write for detailed information, samples, or send us your print for quotation.

C-D-F *Continental-Diamond Fibre*

CONTINENTAL-DIAMOND FIBRE DIVISION OF THE BUDD COMPANY, INC.

NEWARK 2, DELAWARE

The Oakite CrysCoat Cleaning-Phosphating Process for preparing metals for painting

Westinghouse –one of the nation's largest manufacturers of air-moving equipment produces the powerful, portable **Mobilaire** exhaust fan. Beneath this sturdy unit's gleaming finish lies a protective coating of Cryscoat to make it look better . . . last longer.

There's an Oakite CrysCoat Process to suit your particular set-up :–

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Each CrysCoat Process gives you a fine phosphate foundation for long-lasting paint adhesion.

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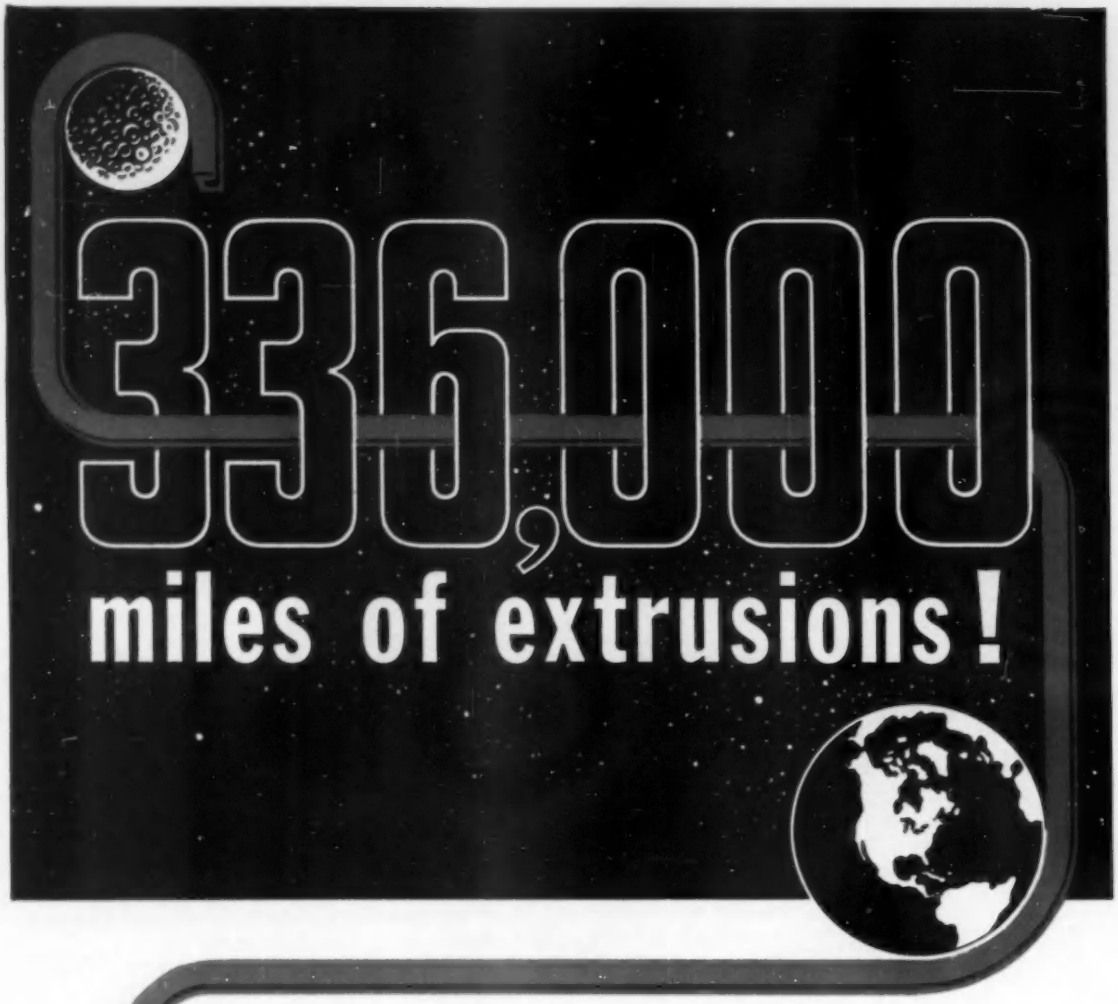
Technical Service Representatives Located in Principal Cities of United States and Canada



Our extruders have turned out enough plastic and rubber extrusions to reach to the moon and halfway back. In compiling this vast experience General Tire's Industrial Products Division has supplied thousands of original equipment manufacturers with just about every known type of extrusion. No job is too large, too small or too complicated for our design and production staff. Perhaps *you* can benefit from the fantastic extrusion mileage we've accumulated down through the years.

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WABASH INDIANA

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To help you provide tractors and trucks which meet the test, Allen offers a wealth of experience in engineering and supplying adaptations which make — 65° starting and operation possible.

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☐ Send representative

Name_____ Title_____
Company_____
Street_____
City_____ Zone____ State_____

MOTOR FACTS ON INDUSTRY'S
MOST PREFERRED "POWER PACKAGE"

Electrical System Fact—Only the new Life-Line "A" motor gives you the unsurpassed corrosion-resistant protection of exclusive new Bondar, Bondite and Mylar* insulations.

*Du Pont Registered Trade-Mark

FACT:

The new Life-Line A is the most corrosion-resistant motor on the market

The corrosive action of chemicals takes a heavy toll on conventional motors. The new Westinghouse Life-Line® "A" motor offers more protection against corrosive atmospheres than any other motor you can buy. How?

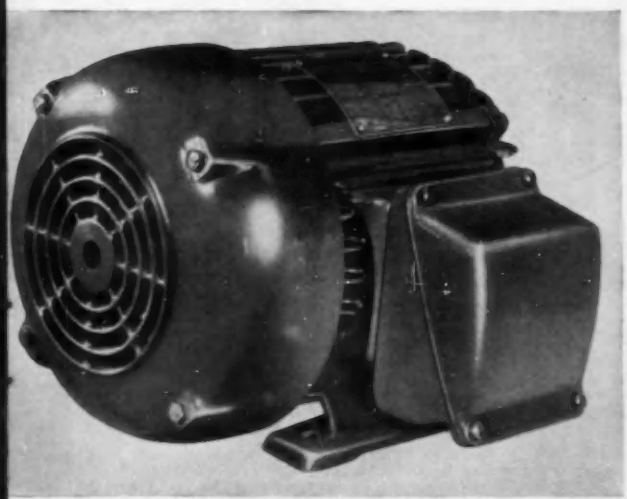
Because the combined improvements in insulation, housing and bearing design give unsurpassed protection against any contamination. It takes the right combination of such improvements in *all three systems*—electrical, mechanical and lubrication—to make the Life-Line "A" industry's most preferred power package.

Get all the facts by calling your Westinghouse sales engineer . . . *The Man With The Facts.*

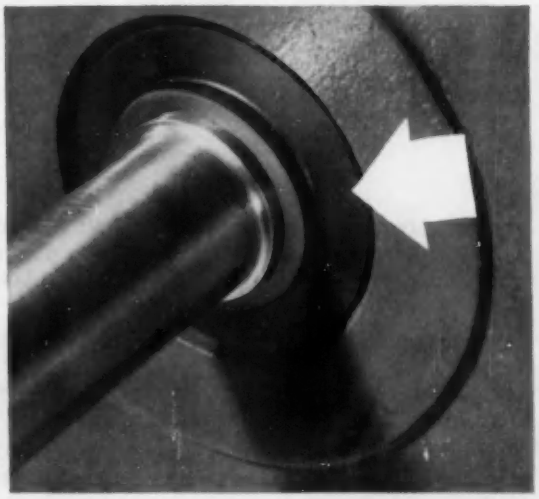
J-21881

YOU CAN BE **SURE**... IF IT'S

Westinghouse

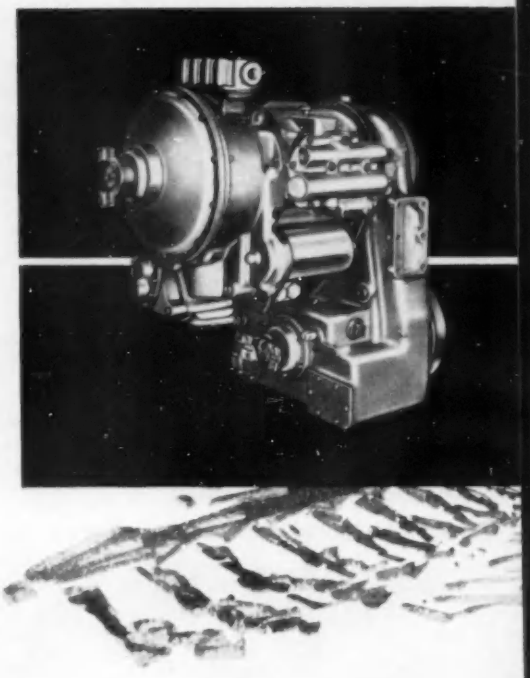


Mechanical System Fact—New cast-iron frames and brackets utilize the finest grained castings with uniformly thick wall sections precisely fitted and sealed. Molded glass plastic cooling fans on totally-enclosed types are chemically inert.



Lubrication System Fact—The new pre-lubricated Life-Line "A" bearing features a "4-way seal"—*two* seals on each side. Totally-enclosed types have additional neoprene flinger which assures bearing protection in any corrosive application.

NOW TORQMATIC DRIVE for Shovel-Loaders



- ★ *One Compact Unit*
- ★ *Speeds Job-Cycle Time*
- ★ *Cuts Maintenance Cost*
- ★ *Reduces Driver Fatigue*

SHOVEL-LOADER manufacturers called on Allison's vast TORQMATIC experience to develop a completely modern converter-transmission team for both 2- and 4-wheel-drive models—and here it is!

It's a TORQMATIC Converter, Transmission and transfer gear drop box combined in one rugged, compact, completely self-contained unit that transmits power from 70- to 130-hp gasoline *or* Diesel engines.

Today six loader manufacturers are specifying this TORQMATIC DRIVE in their newest, most advanced loaders—and with good reason.

Easier to operate—because with this new TORQMATIC DRIVE, drivers have no clutch pedal to push—about half the work in operating a shovel-loader is eliminated.

Faster working—drivers quick-shift on the go without slowing down. And the TORQMATIC DRIVE also broadens the engine's useful horsepower range for faster, more efficient digging and hauling.

Repair bill savings—eliminates shock-load damage to engine and drive-train components. Fewer engine overhauls because engine lugging and stalling is ended.

If you'd build or buy a better loader, be modern—be sure it's TORQMATIC-equipped.

This new TORQMATIC DRIVE is now available in many models of shovel-loaders — both gasoline- and Diesel-powered — and will soon be offered in a wide range of other equipment made by leading manufacturers.

GM TORQMATIC

For more information on this great new TORQMATIC DRIVE, fill out the coupon and mail it today.

Allison
TORQMATIC DRIVES

Allison Division of General Motors
Box 894A, Indianapolis 6, Indiana

Please send me complete information on the new Allison TORQMATIC Converter-Transmission unit.

Name_____

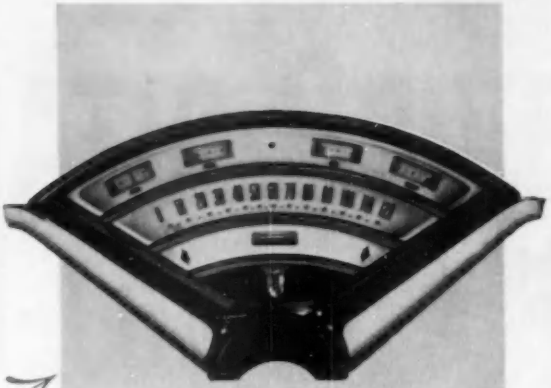
Firm_____

Position_____

Address_____

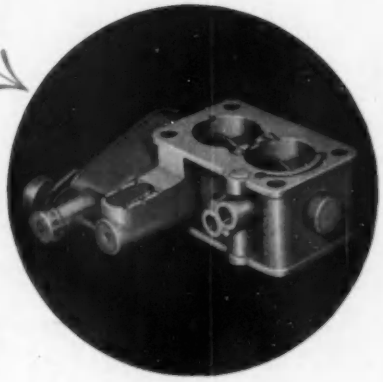
*I am interested in this TORQMATIC Converter-Transmission unit for*_____
(type of equipment)

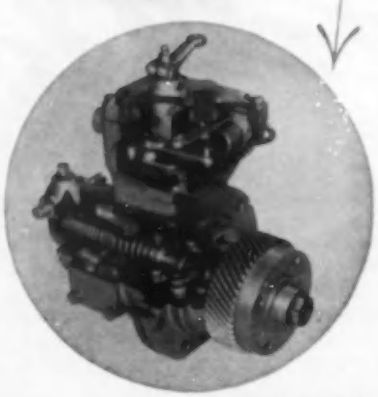
K-S products are STANDARD in the Automotive Industry



INSTRUMENT CLUSTER

VARI-SPEED GOVERNORS





DIESEL GOVERNOR

King-Seeley automotive dashboard instruments, instrument clusters and governors have been very widely used on passenger cars and trucks for the past 28 years. Among the important reasons are:

- The K-S Research Division works continuously in the development of better designs and more effective processing.
- All K-S products are manufactured under a formal chart system of statistical quality control to assure maximum uniformity and dependability.

When you standardize on these products you provide equipment for your customers consistent in quality with the vehicles you produce.

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KING-SEELEY CORPORATION
ANN ARBOR, MICHIGAN

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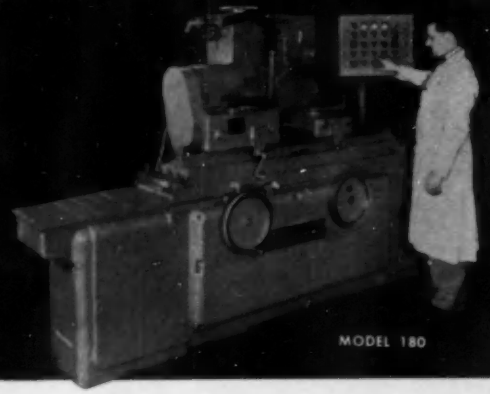
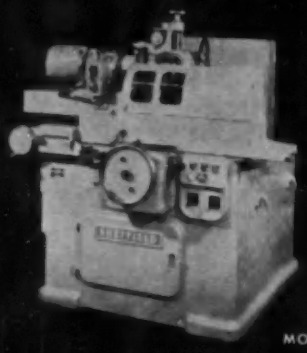
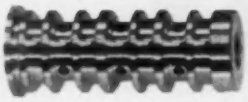
Grind PRECISION FORMS, GROOVES and LANDS *in Record Time* with SHEFFIELD'S CRUSHTRUE MULTIFORM GRINDERS



MODEL 180



MODEL 108

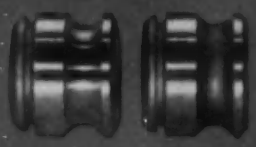


Servo Mechanism Sleeve

The seven grooves of this servo mechanism sleeve are crushtrue ground from the solid to a tolerance of .001" on spacing and .002" on minor diameter in 55 seconds. Material, SAE 52-100; Rockwell, 58-60 C; depth of plunge grind, .145".

Forms and grooves are precision ground on these machines with comparable speed and economy.

For complete details write to Department 810, The Sheffield Corporation, Dayton 1, Ohio, U.S.A.

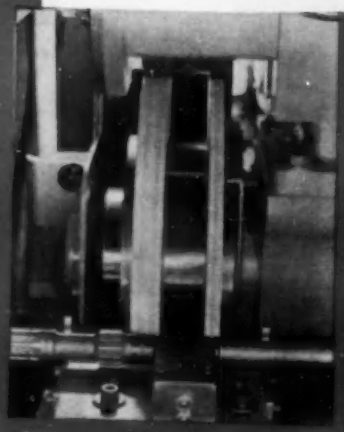


Bearing Race

Aircraft Servo Component

Hydraulic Servo Units

Self-aligning Bearings



Grinding Grooves in a Transmission Shaft

Crushtrue Roll

7214

SHEFFIELD HEADQUARTERS

SHEFFIELD

MANUFACTURE AND MEASUREMENT FOR MARKING

- Dashboard in textured and patterned sheet with built-in color
- Scuff and kick plates in sparkling patterned sheet
- Instrument knobs and door handles in finely textured satin, natural or colored finish
- Moldings in gleaming mirror finish
- Instrument panel trim in gleaming colors and patterns

Your Guide to Aluminum Value

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Styling unlimited!

WITH ALUMINUM "JEWELRY" AT BASE METAL PRICES

By the magic of anodized finish, aluminum may be given the gleam of precious metals, the luster of brushed satin, or brilliant built-in color. Its surface can be textured in a multitude of patterns.

Yet this metal of a thousand faces is an extremely *practical* metal. It can be cast, stamped, drawn, extruded, forged. Easily formed, machined and buffed, it costs less per finished part in many cases than parts of stainless steel or chrome.

Alcoa does not make automotive trim. We *do* offer you unequaled technical guidance in fabricating and finishing aluminum. To make use of this service, contact the nearest Alcoa sales office. For useful design data, write for our new, free 48-page brochure, *Finishes for Alcoa Aluminum*. Address: Aluminum Company of America, 1841-L Alcoa Building, Pittsburgh 19, Pa.

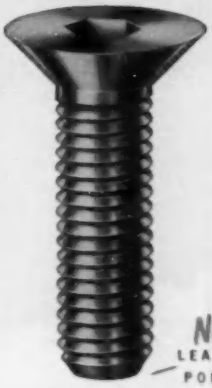
The BUY word for Socket Cap Screws is ALLEN

The *easy* way to make sure of greater strength, better fit and uniform quality in socket cap screws is to order "not just Allen-type but genuine ALLEN."

PRESSUR-FORMING

The latest improvement in the cold forging method originated by Allen. The tough Allenoy steel fibers are preserved continuous and uncut.

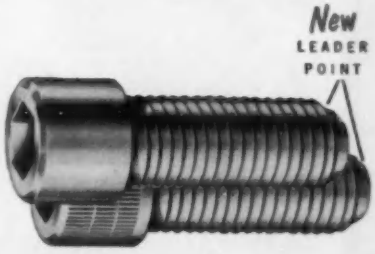
GRIP HEAD CAP SCREWS
The world's easiest starting, straightest driving, firmest holding cap screws.



FLAT HEAD CAP SCREWS
For firm fastening with flush surfaces. Especially adapted to fastening thin plates and sheets.

BUTTON HEAD CAP SCREWS
Produces smooth streamlined appearance where countersinking is impractical.

STAINLESS STEEL



Bright, non-corroding high tensile strength type 18-8. 151 popular sizes (NC & NF) with Smooth Heads *available from stock*. Also standard with Grip Heads in many popular sizes.

THE ALLENUT

Provides a ready-made threaded hole for use with cap screws in soft materials and for repair applications. Endless uses for compact design, space saving.

Sold Only Through

Leading

Industrial Distributors

Take advantage of their large stocks and fastener experience. Write direct for General Catalog G55.

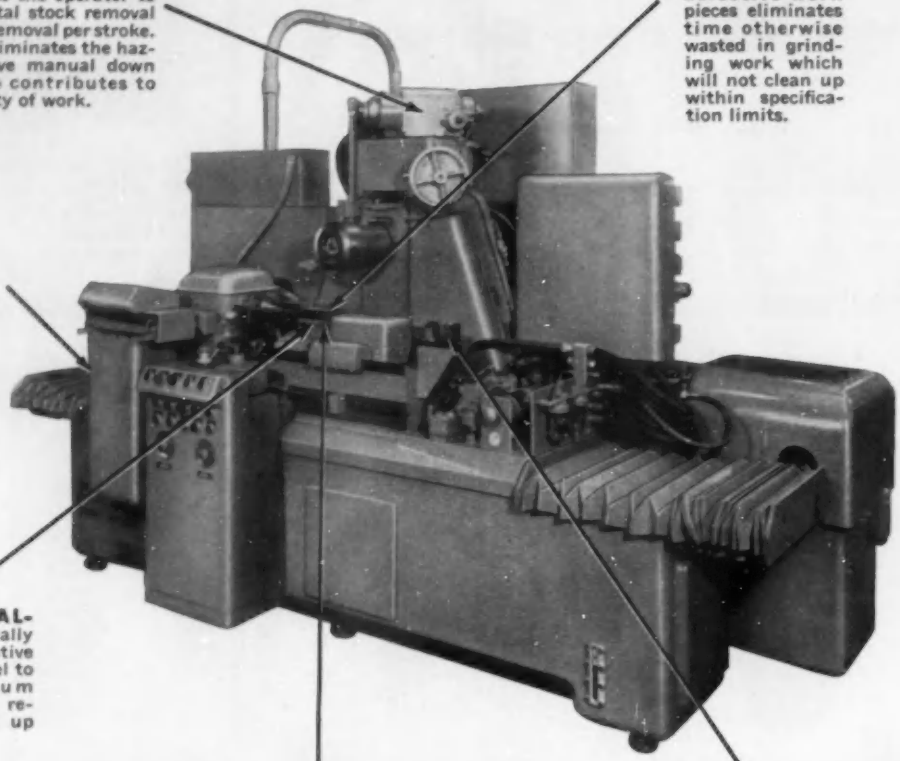
ALLEN
MANUFACTURING COMPANY
Hartford 2, Connecticut, U.S.A.

ALLEN HEAD

AUTOMATIC DOWN FEED control permits the operator to pre-set the total stock removal and the stock removal per stroke. This feature eliminates the hazard of excessive manual down feed and also contributes to uniform quality of work.

AUTOMATIC REJECTION of defective work pieces eliminates time otherwise wasted in grinding work which will not clean up within specification limits.

AUTOMATIC LOADING of the work pieces. The machine can be hopper fed or magazine loaded, as desired.

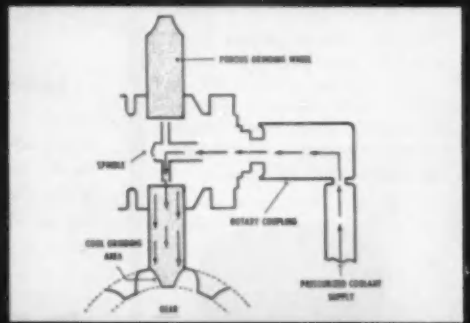


STOCK EQUALIZER automatically locates work relative to grinding wheel to assure minimum stock removal required to clean up the teeth.

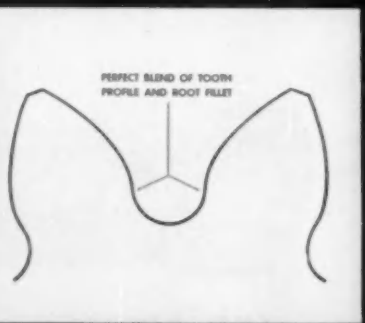
AUTOMATIC RELEASE of work pieces after grinding completes the automatic cycle.

AUTOMATIC TRIMMING of the grinding wheel assures uniformly accurate work. The complete working cycle is automatically controlled.

These 5 improved Features Insure Quality and Production



1 NON-TEMPERED, CASE-HARDENED PARTS. A controlled flow of coolant through the grinding wheel is supplied to the working area between the grinding wheel and the gear tooth. This feature, coupled with the automatic down feed, virtually eliminates the causes of surface tempering and checking during grinding. By eliminating surface tempering, the allowable surface stress of case-hardened gears can be increased tremendously without encountering pitting or scoring.



2 PERFECT BLENDING OF FILLET & PROFILE. Single or double diamond trimmers are used to assure a perfect blend between the tooth profile and the root fillet. Other methods of dressing the wheel result in irregularities at the critical section of the tooth which act as stress risers and frequently cause unnecessary tooth breakage.

INTRODUCED AT THE MACHINE TOOL SHOW...

The FIRST Fully Automatic Gear Grinding Machine in Industry

The development of fully automatic gear grinding machines has been in progress for 10 years at the Gear Grinding Machine Company. They are the product of over 45 years experience in manufacturing gear machines and gears. And here is what these new machines mean to you—the gear manufacturer.

Fine Quality Gears at High Production Rates

These new Geargrind Automatics offer the advantage of producing highly accurate, fully hardened gears at increased production rates. Whatever your gearing application—in job lots or production quantities—you'll save valuable time and decrease the need for skilled operators.

All of these advanced automatic features have been thoroughly tested in long production runs—they are ready to work for you whether your gearing needs are simple or complex. They are available on any of the complete line of gear grinding machines.

FULLY Automatic Gear Grinding Machines for • Internal and External Gears and Splines • Specially Contoured Parts

FOR MORE INFORMATION ON *Fully* Automatic GEAR GRINDING MACHINES—WRITE TODAY

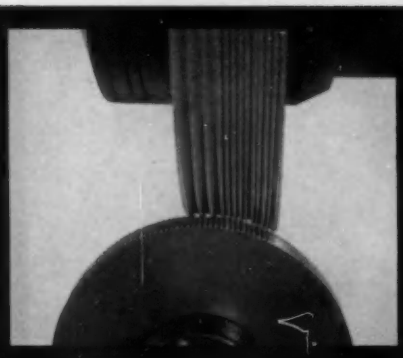
Here is a new 8-page brochure on all 11 of the revolutionary advanced features available on today's Geargrind Automatics. Write or phone now—we'll send it immediately.

THE GEAR GRINDING MACHINE CO.

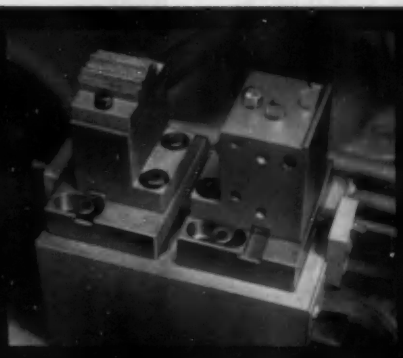
3903 CHRISTOPHER • DETROIT 11, MICHIGAN

Manufacturers of:

THE DETROIT SCREWMATIC 750 • RZEPPA (pronounced "Sheppa") CONSTANT VELOCITY UNIVERSAL JOINTS



3 MULTI-RIBBED GRINDING WHEEL increases the production rate by increasing the number of teeth being ground simultaneously. The number of wheels or ribs that can be used is dependent upon the work being ground. In actual tests, efficiency has been increased over 150%.



4 MULTIPLE FIXED DIAMOND TRIMMERS are used to virtually eliminate grinding wheel dressing time and increase high production. The wheels are simply fed down and then passed directly through the diamonds.

5 TIME RECORDER is provided which accumulates the total machine cycle time for production control.

BIG PRESSES FOR DIE TRYOUT- AVAILABLE NOW!

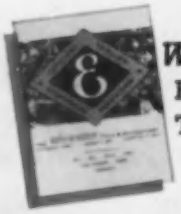
At EFFICIENT every die or tool we build is tested on our own large, modern tryout presses. These presses range up to 1,100 tons capacity (both single and double action presses) with bed dimensions as large as 84" front to back, and 148", right to left, shut height of 84", stroke 34".

After developing and testing of dies, sample parts are produced for your approval. You have no tryout problems because . . .

EFFICIENT *Tooling* is *"Press-Proved"*

The tryout presses illustrated are typical of the equipment housed in EFFICIENT'S modern plants covering 55,000 sq. ft.

EFFICIENT has the machines, the men, the technical know-how and experience to meet your tooling requirements. Large, complex difficult dies are built and "press-proved" in our plant . . . to save production headaches in your plant.

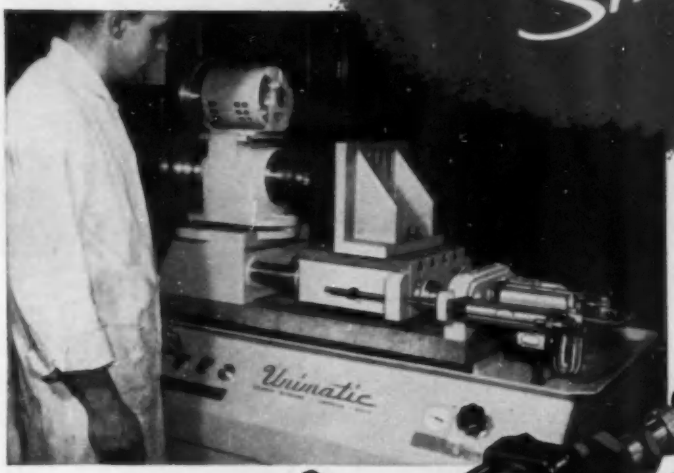


WRITE OR PHONE
For Free Bulletin or Tooling Consultation

THE EFFICIENT TOOL & DIE COMPANY
9314 ELIZABETH AVENUE · CLEVELAND 5, OHIO · PHONE Diamond 1-5150

how to give any air cylinder...

Hydraulic Smoothness



Compressed air has a natural "bounce"—ideal for many operations. But where absolute smoothness of piston rod movement is essential, bounce can be troublesome.

You can make any air cylinder piston rod behave with Bellows Hydro-Check control, This precision control unit, mounted parallel to, or in line with the air cylinder, sets up an opposed, steadying control force that smooths out chatter instantly.

You can have Hydro-Check control when you want it—for a fraction of the stroke, or all of it. With certain models of Hydro-Checks you can have "Skip"—or intermittent checking action; or you can stop an air cylinder piston at any point in its travel for a predetermined time and then resume traverse. Hydraulic control can be on either advance or retract strokes or on both.

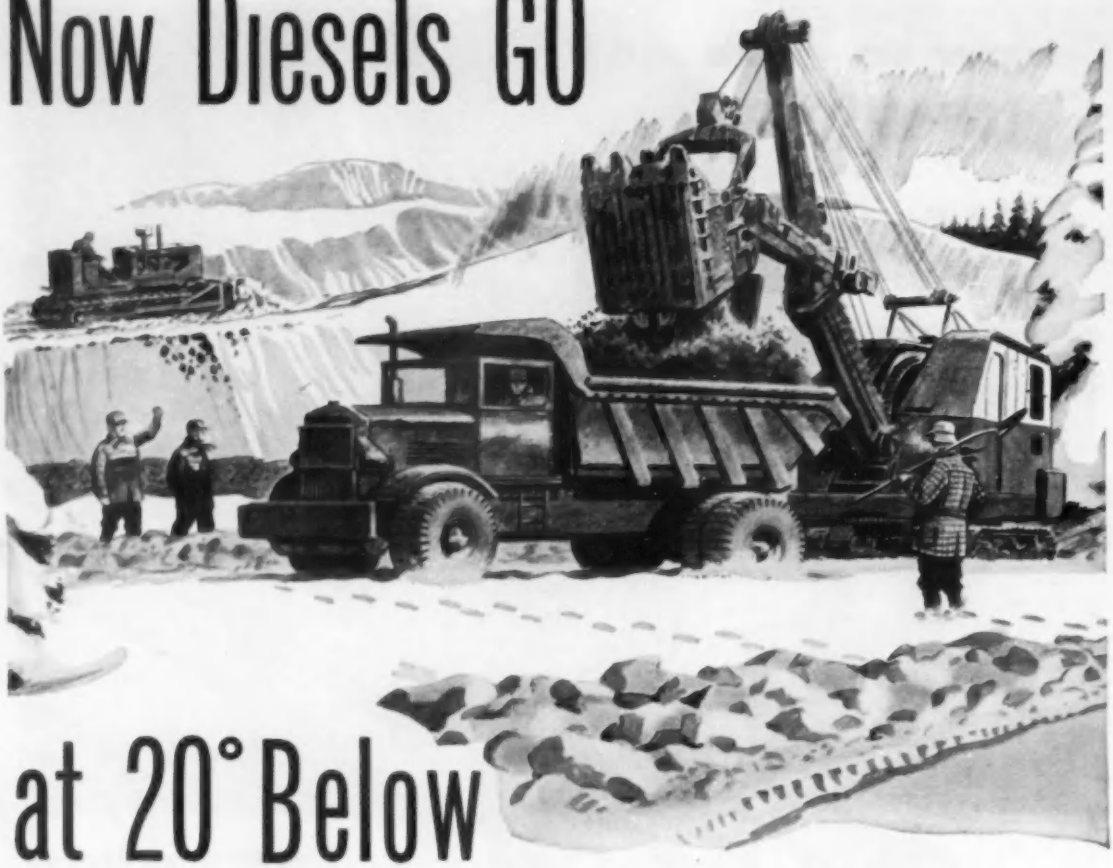
If you use air cylinders in precision operations, you'll want to know more about Bellows Hydro-Checks — precision hydraulic control for air cylinder power. Write for Bulletin HC-601 Address: The Bellows Co. Dept. AI 1155 Akron 9, Ohio. In Canada: Bellows Pneumatic Devices of Canada, Ltd. 14 Advance Rd., Toronto, Ont.

The Bellows Co.

AKRON 9, OHIO

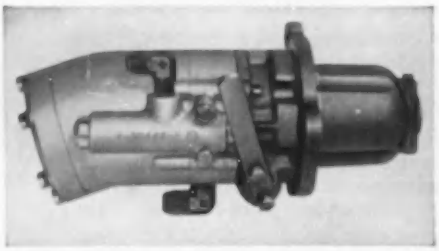
1223-A

Now Diesels GO



at 20° Below

New Hydrostarter Spins Engines Faster



Heart of the Aeroproducts Hydrostarter is this hydraulic starting motor which spins a Diesel twice as fast as battery-operated starters.

Now, before winter sets in with a vengeance, is the time to put a new, low-cost Aeroproducts Hydrostarter on your Diesel.

Even at 20° below zero, this hydraulic starting system gives you quick, sure starts on every Diesel up to 300 horsepower no matter how long your equipment has been standing idle. The motor delivers maximum torque at all temperatures to overcome starting inertia.

It replaces conventional starting systems, frees you from many maintenance problems and costs less to operate.

And it sells for a far lower price than any other nonelectric Diesel starter available today.

Your Diesel engine or equipment dealer can install an Aeroproducts Hydrostarter on your Diesel in just a few hours' time. He can give you full information—or quickly get it for you. See him today or write direct for full details.

General Motors engineering leads the way

Building for today...Designing for tomorrow

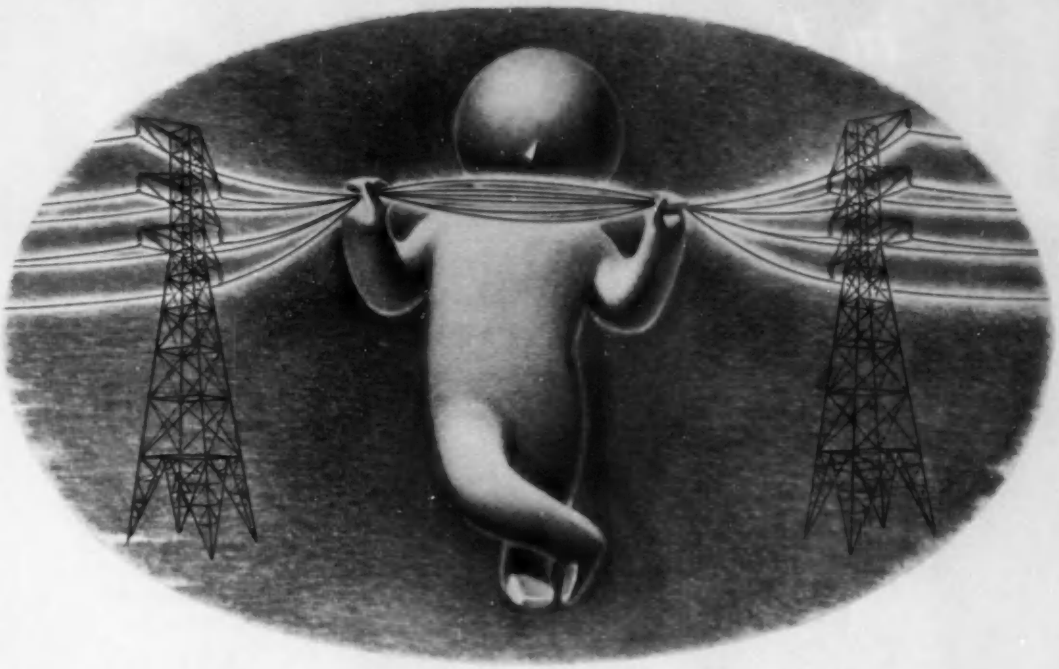
Aeroproducts

ALLISON DIVISION OF GENERAL MOTORS, DAYTON, OHIO

How can you benefit from the amazing

ELECTRICAL PROPERTIES

of G-E silicone rubber AT HIGH TEMPERATURES?



Amazing electrical properties at high temperatures are among the outstanding characteristics of General Electric silicone rubber. It is ideal for wire and cable insulation where overloads or space limitations dictate a heat-resistant dielectric. Cables have been redesigned with G-E silicone rubber to carry nearly *twice the current—with no increase in size!* G-E silicone rubber not only provides Class H insulation, but can be used to improve Class B insulation as well.

Where can YOU use G-E silicone rubber? There's a kind for almost every requirement, classified according to dominant property for easy selection and specification. For example: Class 300 offers the best recovery after compression *of any known rubber!* Class 500 provides flexibility *at 130°F below zero!* Which class is best for *you?*

SEND FOR A FREE "LIGHTNING SELECTOR"—TODAY!

G-E SILICONE RUBBER PROVIDES...

Outstanding resistance to extreme temperatures

Superior resistance to compression set

Dielectric strength stable at high temperatures

Unequalled resistance to aging, ozone, weathering

G-E silicones fit in your future

GENERAL ELECTRIC

Silicone Products Department
General Electric Company
Section S1-88
Waterford, New York

Please send me technical data on G-E silicone rubber, including a free "Lightning Selector" and up-to-date list of fabricators.

Name_____ Position_____

Firm_____

Street_____

City_____ Zone____ State_____

IN CANADA: Mail to Canadian General Electric Company, Ltd., Toronto

BEARINGS...

A Control Factor in Performance!

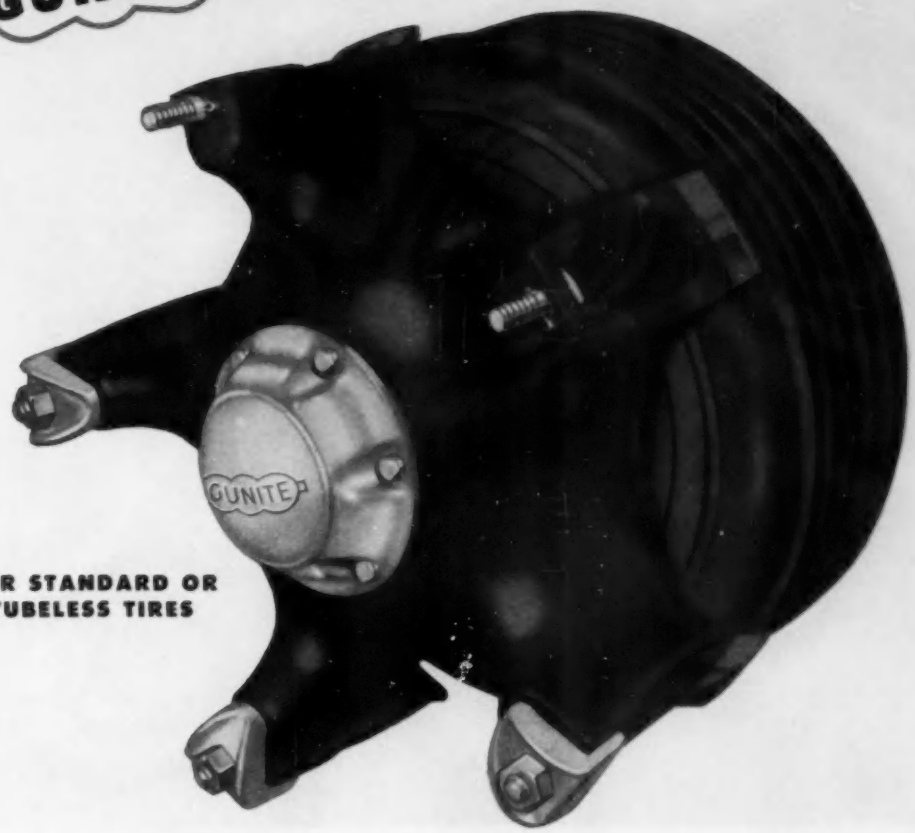
RESEARCH • DESIGN • METALLURGY • PRECISION MANUFACTURING

Here are industry's work horses . . . dependable diesel engines. They power trucks, tractors, construction equipment. As mobile units they bring light, power and compressed air to the job. As stationary units they light towns and villages. As stand-by units they provide emergency power and light. Their dependability is vital. To help assure this dependability we supply quality bearings for many sizes and types of diesels and are a major supplier to diesel engine builders. **FEDERAL-MOGUL DIVISION,** Federal-Mogul-Bower Bearings, Inc., Detroit 13, Michigan.

FEDERAL-MOGUL
DIVISION

SINCE 1899

GUNITE STEEL WHEELS FOR TRUCKS AND TRAILERS

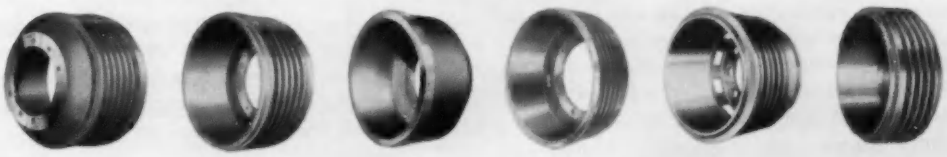


FOR STANDARD OR TUBELESS TIRES

Lightweight...

Economy . . . Strength . . . Gunite Wheels and tubeless tires form the lightest combination at the lowest price. Specify Gunite Wheels on your new equipment.

Gunite Brake Drums for Trucks, Trailers and Busses



GUNITE FOUNDRIES CORPORATION • ROCKFORD, ILLINOIS

Established in 1854

Mayari R makes it lighter... stronger... longer lasting

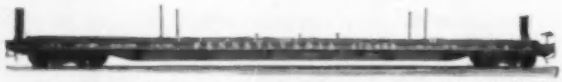
How Mayari R gave extra strength to these 75-foot Van-Cars

These new Van-Cars,* each 75 ft long, are carrying trailers in the new "TrucTrain" service that the Pennsylvania Railroad has inaugurated, with The Rail-Trailer Co. acting as coordinator between the railroad and motor common carriers.

Because of the unusual length of these cars they had to be extra-strong between bolsters, yet without excessive weight. For this reason, load-bearing members such as center sills, side sills, stringers and crossties were built of Mayari R high-strength, low-alloy steel. With half again the strength of carbon structural steel, these and other Mayari R members supplied ample strength while holding the weight down to 79,000 lb per car.

More and more Mayari R is becoming the choice for railway cars and motive power, automotive vehicles and trailers,

*Van-Car Corporation, which owns these cars, is the car-leasing subsidiary of The Rail-Trailer Co.



These specially-designed cars are 75 ft long, have a capacity of 125,000 lb. Hinged ramps at car ends allow end-loading in strings.

as well as a host of industrial applications. It is readily welded and worked, and holds paint up to 80 pct longer than plain carbon steel. Catalog 353 shows dozens of outstanding applications of Mayari R, some of which probably have a bearing on a problem confronting you. A phone call or note will bring you a copy promptly.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

(Advertisement)

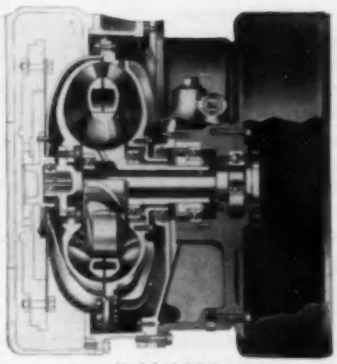
Fuller announces 3 new torque converter couplings

. . . designed for a wide variety of industrial applications

Three new Fuller Torque Converter Couplings nominally rated at 280 foot pounds of torque are now available for increasing work capacity in a wide variety of industrial applications.

The Fuller Industrial Torque Converter Couplings consist of three simple elements; impeller or pump, runner, and reaction member. With single stage two phase design, the reaction member is mounted on an overrunning clutch which permits rotation with the runner, and operation as a straight hydraulic coupling for high efficiency. The change from 2.1:1 conversion stage operation to straight hydraulic coupling stage and back is automatic, depending only upon the amount of torque required in the drive line.

Advantages of the 2.1:1 torque multiplication and smooth fluid coupling operation provided by the new Fuller Torque Converter Couplings include obtaining faster work cycles . . . with less downtime and less maintenance. Typical applications are: fork lift trucks, winches, loaders, self propelled cranes, truck cranes, lumber carriers . . . and diesel and gasoline locomotives.



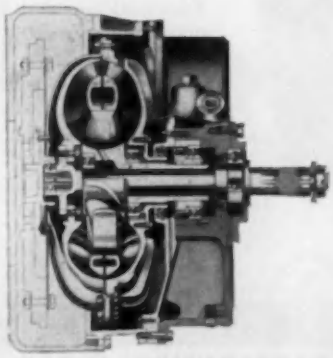
Model 12-T-280

The New 12-T-280

This new Fuller Torque Converter Coupling incorporates an SAE No. 3 clutch housing behind the converter. The output shaft is flanged for attachment of a single plate clutch flywheel.

The New 12-U-280

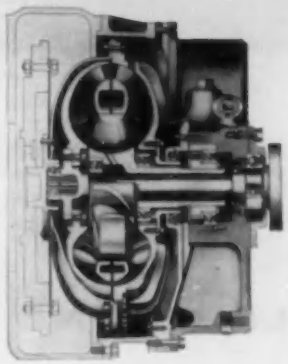
The Model 12-U-280 Fuller Torque Converter Coupling incorporates a 1½" ten-spline shaft on the output end, without clutch housing, for straight line drives through a universal joint.



Model 12-U-280

The New 12-H-280

A new model which incorporates a flange at the output shaft, for attachment of industrial type couplings.



Model 12-H-280

For Tough Tasks— It's Fuller by Far!

Where frequent start-and-stops, or heavy, intermittent shock loads threaten to overwork engines, transmissions, axles, brakes and tires . . . use the fluid cushioning of these new Fuller Torque Converter Couplings to *absorb* and *eliminate* shock loads.

Torque demand is matched to the load through the 2.1:1 torque multiplication of the converter . . . automatically changing to fluid coupling as the load is reduced. These new Fuller Torque Converter Couplings *keep* engines operating in the high rpm range under all conditions of vehicle load and speed.

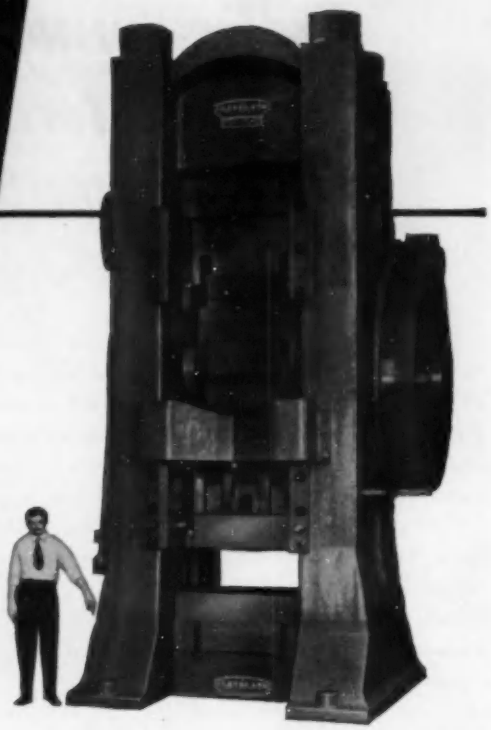
See your equipment dealer *today*. Specify Fuller Torque Converter Couplings in your new equipment for better performance.

FULLER MANUFACTURING COMPANY
TRANSMISSION DIVISION • KALAMAZOO, MICH.

Unit Drop Forge Div., Milwaukee 1, Wis. • Shuler Axle Co., Louisville, Ky. (Subsidiary) • Sales & Service, All Products, West. Dist. Branch, Oakland 6, Cal. and Southwest Dist. Office, Tulsa 3, Okla.

250 TONS OR 2500 TONS

Large or small . . .
your stampings cost less
with a
CLEVELAND PRESS!



Cleveland 25K Knuckle Joint Press 2500 tons capacity

Cleveland S1-250-36-42 Straight Sided Single Point Press 250 tons capacity

Each of the 11 specialized types of Cleveland Presses is made in a wide range of sizes. You're sure of getting the exact press to give you utmost production economy.

The construction of all Clevelands is simple and powerful featuring ease of adjustment, minimum wear of moving parts, economy of operation and production accuracy.

You'll find that our patented Cleveland Clutch minimizes costly down-time. It gives you positive, fast control of the slide during all phases of operation. This reduces stamping rejects. What's more its light-weight design requires less horsepower for operation.

Extremely long slide bearing surfaces and rugged frame construction eliminate slide deflection even under maximum load.

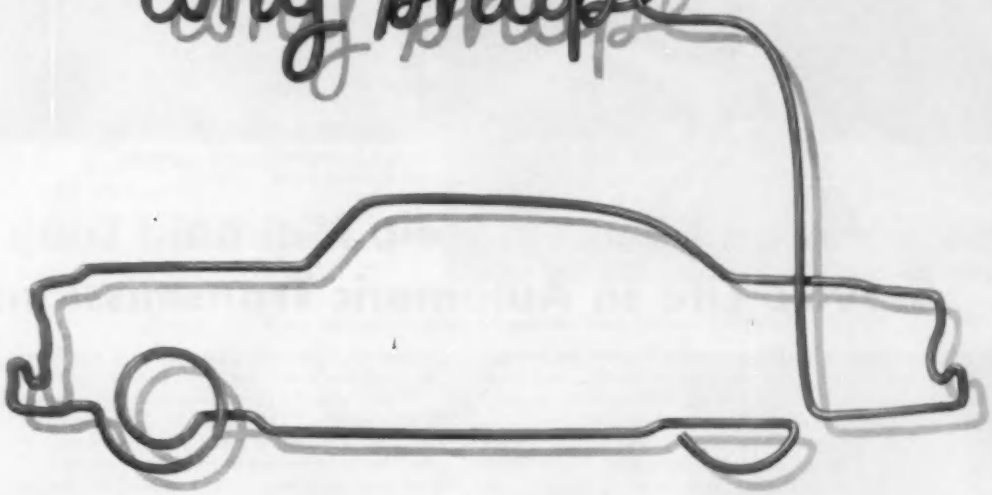
These important Cleveland features assure you of lower unit stamping costs. Before you buy your next press won't you let us give you the complete Cleveland story? Just write or call today!

1880 75 1955 YEARS OF CONSTANT PROGRESS
Diamond Anniversary

THE CLEVELAND PUNCH & SHEAR WORKS CO.
Established 1880

POWER PRESSES
FABRICATING TOOLS
E. 40TH & ST. CLAIR AVENUE • CLEVELAND 14, OHIO
Offices at: NEW YORK • CHICAGO • DETROIT • PHILADELPHIA • E. LANSING
CITY FOUNDRY DIVISION • SMALL TOOL DEPARTMENT

for tubing
that can take it—
and can take
any shape



Remember
GM STEEL TUBING
By Rochester Products

GM STEEL TUBING BY ROCHESTER PRODUCTS, DIVISION OF GENERAL MOTORS, ROCHESTER, N.Y.

On the production line in a large midwest automatic transmission plant, a Johnson bearing is pressed into the rear pump housing.

Johnson Bearings Help Maintain Long Service Life In Automatic Transmissions

The long, trouble-free service enjoyed by owners of automatic transmissions produced in this large midwest plant stems from the exacting quality control of all components and operations.

For example, the assembly and testing rooms are air-conditioned and dust-proof. There is no smoking permitted in these rooms. Special care is taken to prevent dust from getting into the transmission. All machines are wiped with lintless rayon cloths. Even the floors of these rooms are coated with oil to keep down dust.

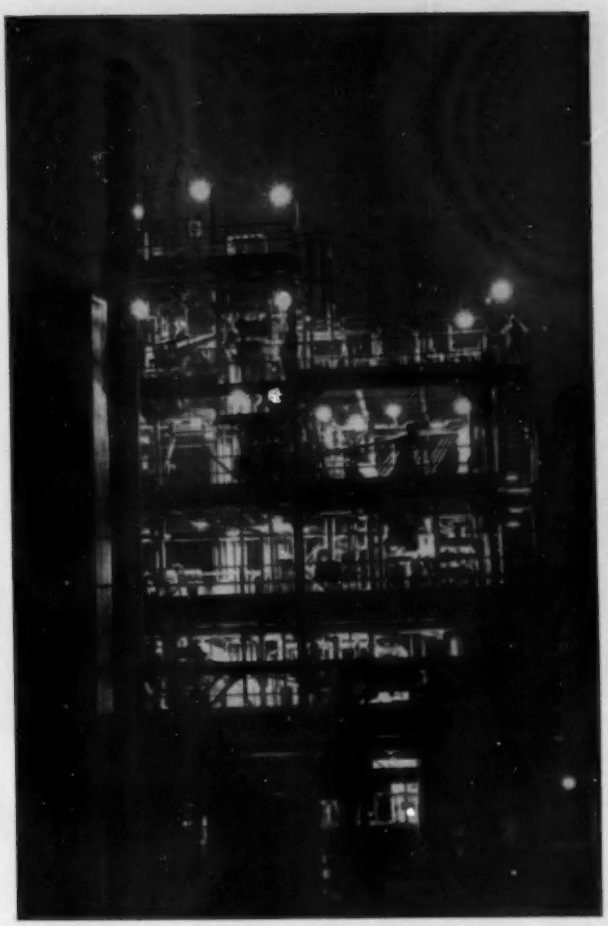
With such close attention to every detail it is easy to understand why Johnson was selected as one supplier of the steel backed bearings, both copper alloy and babbitt lined, used in the assembly. Johnson takes great pains in the manufacture of these bearings to assure that these critical parts will be made of an alloy that is consistent in composition and that the bearings are uniform in size and surface finish.

That's why the coordinator of engineers in this plant reports, "Our assembly lines have never had that first bit of trouble with Johnson bearings. Johnson service is good, too—since our factory buys supplies at a lead time of 10 to 60 days, good service means everything in mass production timing."

This fine acceptance of Johnson quality and service is not unusual in the automotive field, for Johnson is an important supplier of main, cam and rod bearings, and bearings for practically every other component in the modern car, truck or diesel engine made today. To learn more about Johnson quality and service, ask one of our engineers to call. Johnson Bronze Company, 625 S. Mill Street, New Castle, Pa.

Johnson Bearings

Up all night with a new arrival



The lights are burning late at our new plant in Parlin, New Jersey. We're working around the clock to supply the field of photography with a revolutionary product — a new polyester photographic film base, "Cronar"®.

"Cronar" is extremely tough, permitting a thinner film base to be used. It's so flexible that films lie flatter in cameras, making handling easier and reducing the risk of error. And "Cronar" polyester photographic film base resists changes in temperature and humidity better than *any other* flexible base! That's *very* important for making *accurate* reproductions under varying conditions.

Du Pont "Photolith" lithographic film, used by the graphic-arts field, will soon be on "Cronar," and before long we'll introduce other films on "Cronar" base. For more information about this superior new base, just mail the coupon below for an interesting free booklet.

Other Du Pont Photographic Products also serve industry

FLUOROSCOPIC EXAMINATION insures golf-ball quality by checking brilliant image of concentric core with G. E. x-ray unit using Du Pont "Patterson" Fluoroscopic Screen.

HIGH SPEED motion-picture camera loaded with Du Pont 931 film shoots test blast at 3,400 frames per second! Pattern of explosion can then be studied in slow motion.

X-RAY EXAMINATION and plant efficiency work hand in hand. Many firms use Du Pont x-ray film to check injuries and safeguard health of personnel.

DU PONT

Photographic Products

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

E. I. du Pont de Nemours & Co. (Inc.)
Photo Products Department
Wilmington 98, Delaware.

Please send me information about

☐ "Cronar" polyester photographic film base
☐ High-speed motion-picture film
☐ Fluoroscopic screens
☐ Medical x-ray films

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TITLE_____

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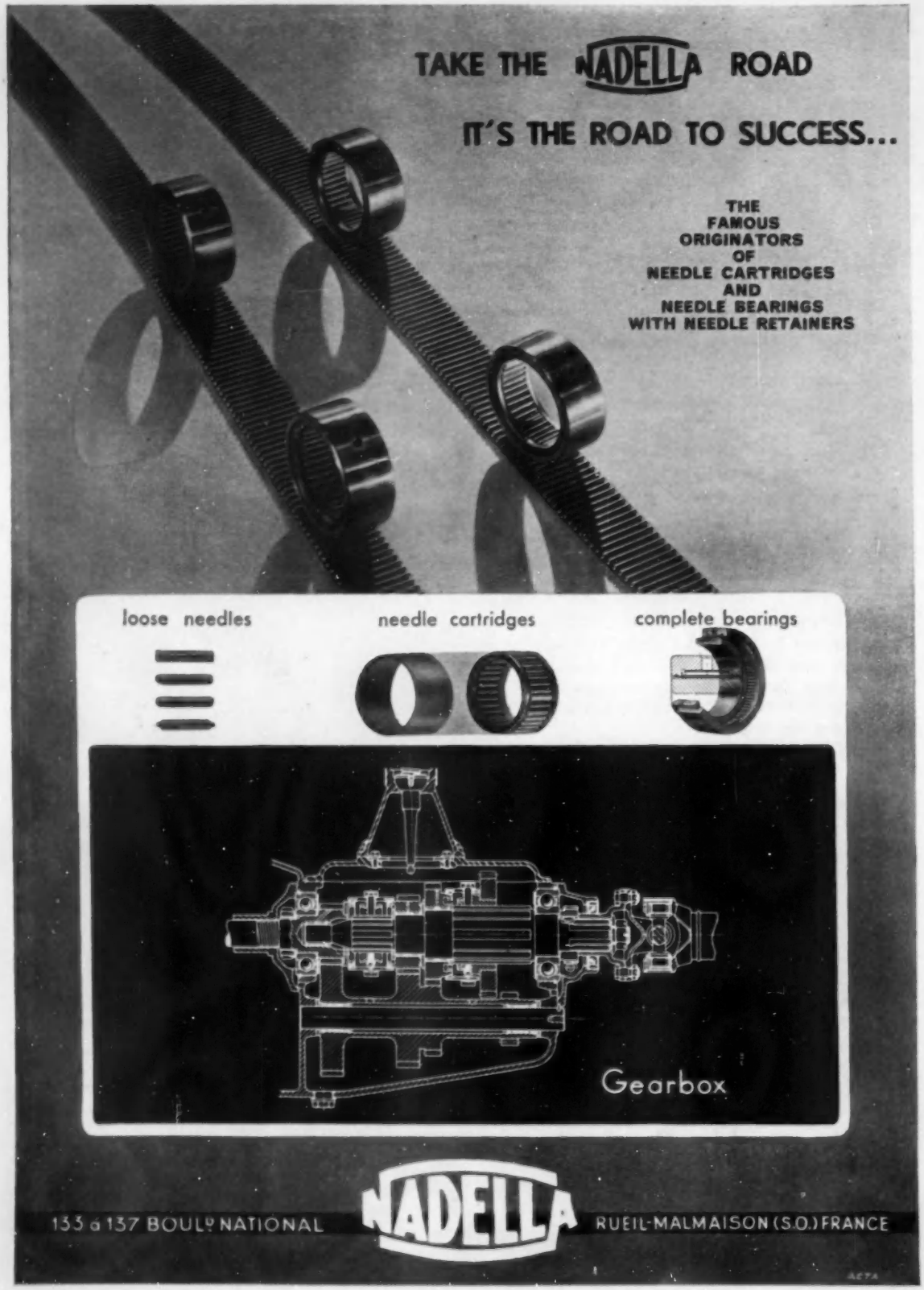
STREET_____

CITY_____ STATE_____

☐ Please have your Technical Representative call. 1811


TAKE THE NADELLA ROAD
IT'S THE ROAD TO SUCCESS...
THE FAMOUS ORIGINATORS OF NEEDLE CARTRIDGES AND NEEDLE BEARINGS WITH NEEDLE RETAINERS
loose needles
needle cartridges
complete bearings
Gearbox
133 à 137 BOULd NATIONAL
NADELLA
RUEIL-MALMAISON (S.O.) FRANCE

"I, sir, wash my own car!"

This car washing is a great American hobby. As soon as one man starts, you find the whole neighborhood outside, kinking the hose, sloshing through puddles, having fun. They wield an incredible array of long-handled brushes, sprays and mops, assisted by a witches brew of foaming detergents, cleaners, waxes, powders, pastes, liquids and creams.

When the car is washed, the man of the house begins an inch-by-inch check of the glittering trim. Does it really shine? Or does it blister? Or peel?

People are proud of their cars, and they want them to stay bright. If your dealers can assure prospects that the trim will resist corrosion and denting like nothing else, you might furnish that nudge that clinches a sale.

When your trim is made from Stainless Steel, you can make these promises in all good faith. People know what Stainless is, for they use it every day in the form of flatware, pots and pans, sink tops and the like.

The beauty is more than skin deep when you use trim made from service-tested USS Stainless Steel. There's a size and finish for every possible need.

See "THE UNITED STATES STEEL HOUR"—Televised alternate weeks—Consult your newspaper for time and station.

UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
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USS STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS
PIPE · TUBES · WIRE · SPECIAL SECTIONS

USS

UNITED STATES STEEL

Best for meeting customer demand... all year round

United Air Lines Air Freight

Many businesses first learned the advantages of United Air Lines Air Freight by using it to "fill in" inventories during peak buying seasons.

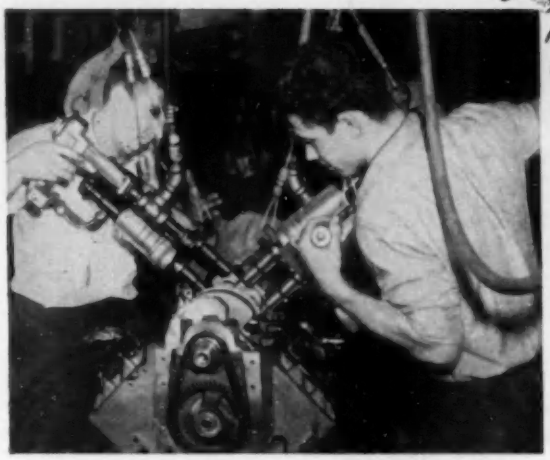
Now they use it profitably and enthusiastically throughout the entire year for many other good reasons—to maintain a better control of inventories... to improve customer service... to obtain higher prices through better service... to reduce the number of cancelled orders through faster delivery... to protect the condition and appearance of goods at destination by reducing in-transit damage... and to bring down the cost of packing, crating and warehousing.

Why not plan to use United Air Lines Air Freight regularly during the coming year? The cost is lower than you might think. For example, a leading dress manufacturer ships children's dresses coast to coast for only about 14¢ each!

Remember, too, only United offers Reserved Air Freight space on all equipment—not only over its own routes, but world-wide through connecting airline agreements.

For speed, dependability and economy, learn the advantages of United Air Lines Air Freight Service. Call the nearest United Air Lines Representative or write for free booklet, "Industry's Flying Partner." Cargo Sales Div., Dept. 1-11, United Air Lines, 5959 S. Cicero Avenue, Chicago.

Multiple Spindles provide Greater Output!



2-Spindle Multiples tighten connecting rod bolts on the assembly line.

A 6-spindle Multiple Nut Setter assembles automobile crankshaft to flywheel.

The new Keller Multiple Nut Setters improve quality control and reduce production costs. Manufacturers have been quick to make use of their advantages:

1. Built-in torque regulation in each individual spindle, giving control of torque on each bolt. Torque is adjustable from 4 to 190 ft/lb.
2. Torque held within close tolerances—comparable to that obtainable with accurate hand tools.
3. Increased production and lower production costs.
4. Easily adaptable to changing needs . . . a change in bolt spacing merely requires a new mounting plate for the spindles . . . when a job is completed the spindles are completely salvageable for use in another Multiple.

Do you have applications where bolts or nuts can be run and tightened two or more at a time? If so, it will pay you to investigate this remarkable tool. Write for Bulletin 16-101.

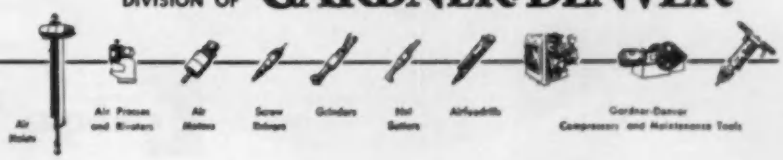
GARDNER-DENVER

K KELLER TOOLS

KELLER TOOL

DIVISION OF GARDNER-DENVER

GRAND HAVEN, MICHIGAN



A NEW PERSPECTIVE IN PRODUCTION

WITH LODGE & SHIPLEY *Powerturn* LATHES

It's time to take a new view of lathe economics. Whether the lathes in your plant are used for production or general purpose, you should be sure that they are producing as economically as possible. Lathes only a few years old may be liabilities from the standpoint of truly low cost production.

New Lodge & Shipley POWERTURN Lathes are designed in every way to facilitate turning to higher levels of profitable operation. Among many new features is the exclusive Computing Head which makes speed selection virtually automatic since the head indicates correct speed lever settings.

With all the new features, these Lathes offer traditional Lodge & Shipley rugged strength, power and accuracy. Get the facts now. "Up-date" lathe facilities for profitable production. Write for detailed literature: The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

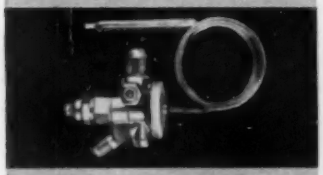
16" POWERTURN Engine Lathe
(also manufactured in 13" and 20" Standard sizes, in Toolmaker, Gap, Manufacturing and 45° and 90° COPYMATIC models)

more than ever before . . .
your LODGE-*ical choice is*

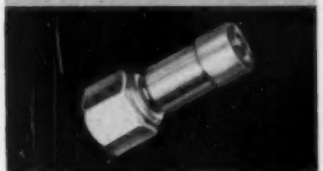
Lodge & Shipley

COOLING ON THE MOVE

RV-1A and RV-2F Mobile Refrigerant Valve for freon-12 and freon-22. Electromagnetic, normally closed, packless, continuous duty. Working pressure: 450 psi. Available in aluminum, or brass at slight additional cost.



V-200G Thermostatic Expansion Valve for freons, methyl chloride, and sulphur dioxide. External/internal equalizer, adjustable superheat, 2-ton capacity.



Series 9-C Refrigerant Distributor. Divides flow equally between two or more evaporator coils. Adaptable to all standard installations, interchangeable nozzles for various capacities.

THE HEAT'S OFF!

on passengers or perishables

with General Controls on the job

Mobile refrigeration and cooling alike require a very special kind of controls to stand up under the stress, strain, and shock which "cooling on the move" involves. That's why General Controls, long experienced in both the refrigeration and automotive fields, offers the essential combination that makes this famous line the *natural choice* for both commercial and consumer use.

And—judging from their proved performance in countless, road-proved installations by some of the nation's biggest automotive manufacturers—General Controls' products are the *best choice* for your needs.

So whether it's produce off to the market, or the family out for a Sunday drive, you can *depend* on General Controls.

Write for Catalog 54R giving complete information.

General Controls for MOBILE REFRIGERATION and AIR CONDITIONING CONTROLS

GENERAL CONTROLS

MANUFACTURERS OF AUTOMATIC CONTROLS FOR HOME, INDUSTRY AND THE MILITARY

GENERAL CONTROLS • PEERLESS CONTROLS

40 FACTORY BRANCH OFFICES SERVING THE UNITED STATES AND CANADA

FIVE PLANTS: IRON MOUNTAIN, MICHIGAN • GLENDALE, CALIFORNIA • BURBANK, CALIFORNIA • SKOKIE, ILLINOIS • GUELPH, CANADA

Quantity
PRODUCTION
of
GREY IRON CASTINGS

ONE OF THE NATION'S
LARGEST AND MOST MODERN
PRODUCTION FOUNDRIES

ESTABLISHED 1866

THE WHELAND COMPANY

FOUNDRY DIVISION

MAIN OFFICE AND MANUFACTURING PLANTS

CHATTANOOGA 2, TENNESSEE

RICHARDSON

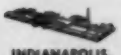
helps improve molded auto parts

Each of the molded parts pictured here had specifications which called for special materials often with unusual properties. All called for creative design approaches, both by customer and Richardson.

Richardson engineers, specialists in both molded and laminated plastics, will welcome the opportunity to help you. Write or phone for additional information.

THE RICHARDSON COMPANY
FOUNDED 1858
2678 Lake St., Melrose Park, Ill. (Chicago District)

MELROSE PARK, Ill.



INDIANAPOLIS, IND.

NEWNAN, GA.

OGDEN, UTAH

SALES OFFICES IN PRINCIPAL CITIES

NEW BRUNSWICK N. J.

TYLER, TEXAS

. . water pump impeller A special moisture resistant phenolic was specified for this part which must withstand the extremes of both high heat and intense cold, as well as strong torque action plus corrosion and cavitation resulting from the circulation of water in the car's cooling system.

. . timing gear The molded blank of this gear had to have high flexural characteristics . . also a good bond in the laminate section for ease in cutting gear teeth, and to insure necessary tooth strength. The manufacturer and Richardson developed a new material with high heat resistance. Result: Fine flexural strength in the web section . . more quiet operation . . . easier fabrication . . . easier assembly . . . *tripled gear life!*

. . radio antenna mast base This part had to have good surface appearance, high impact strength, high dielectric strength, and at the same time be weather resistant. A black phenolic material with an attractive high gloss finish was recommended.

. . dashboard light lens Originally this part was designed as a clear lens. Later, when the specifications were changed to call for a translucent lens, the customer suggested that either the mold, or the clear parts, be sandblasted . . either process would have increased costs. Richardson suggested, instead, a special light-transmitting polystyrene. Result: 15% reduction in lens cost.

RICHARDSON PLASTICS

MOLDED AND LAMINATED

TOPS
in cold finished carbon steel bars
"J&L 1200"
Use "J&L 1200" steel
on your tough jobs for . . .
tops in quality
tops in machinability
tops in uniformity
tops in finish
available in all standard
shapes and sizes
"J & L
1200" Steel
provides the
qualities that
help machine oper-
ators do top-flight
work at lower overall
costs. With "J&L 1200,"
the operator obtains: better
machine finishes . . . longer
tool life . . . higher rates of speed.
This fact has been proven time and
again—in shop after shop.
"J&L 1200" grades meet the composi-
tions published by the A.I.S.I. . . . S.A.E.
. . . and Federal Specifications QQS-633.
Try this steel in your own shop. Results
will convince you "J&L 1200" deserves to
be a regular specification for your produc-
tion runs.
J&L
STEEL
Jones & Laughlin
STEEL CORPORATION — Pittsburgh

TIRELESS HORSEPOWER

New BROCKWAY MODEL 255-W Tractor; 144-inch wheelbase. G. T. W. 65,000 lbs. 2-speed axle; 5-speed overdrive transmission. Power: Continental Red Seal Cushioned Power Diesel Model RD-6572.

for the WORLD'S WORK

ONLY CONTINENTAL CUSHIONED POWER* DIESELS GIVE YOU ALL THESE SUPERIORITIES

HIGH ECONOMY . . . due to higher combustion efficiency • MORE USEFUL POWER . . . pressure on pistons applied at most effective crank angle • REDUCED PRESSURE PEAKS . . . for smoother, quieter running, and long life of parts • SELF-CLEANING NOZZLES . . . automatically cleaned with each injection; assure smoother running • LOW UPKEEP COSTS . . . reduced pressures permit use of lower cost high production parts • EASY STARTS ON DIESEL FUEL . . . no auxiliary power needed.

Red Seal Cushioned Power* Diesels are getting the call for more and more of the really tough jobs, not only in transportation, but in industry, in construction, and on the farm. Why? Because Cushioned Power Diesels provide ALL the advantages of the Diesel principle, with none of the drawbacks common to Diesels of conventional design. You'll be far ahead, all the way, standardizing on equipment built around dependable Red Seal Cushioned Power—or using it to replace heavier Diesels of conventional design.

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Continental Motors Corporation

MUSKEGON, MICHIGAN

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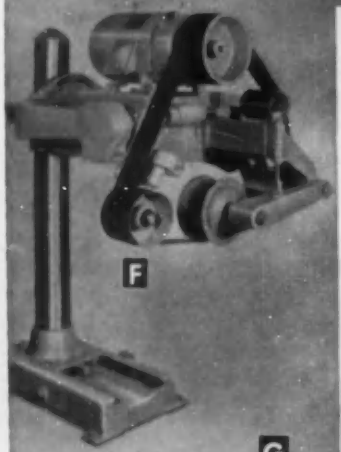
MURRAY-WAY the automatic way / the economical way / the better way

to POLISH . . . BUFF . . . GRIND . . . FILTER

Whatever your job . . . whatever your problem . . . Murray-Way automatic equipment will do that job better and more economically.

These are just a few illustrations of Murray-Way's success in beating production cost with the finest automatic equipment available.

You can depend on Murray-Way engineering, Murray-Way experience, Murray-Way equipment to solve your production problems.



A. Micro-Polish—Continuous Strip Polishing Installation
B. Vertical-Platen Conveyor
C. Horizontal-Platen Conveyor
D. #51 Universal Polishing Head —One of Several Standard Polishing Heads
E. The Automatic, Self-Cleaning, Compact Filter
F. #72 Series Belt Polishing Head
G. Indexing Dial Table
H. Six Micro-Polish Units in Series

P. O. Box 180, Maple Road, E.
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MURRAY WAY CORPORATION

POLYETHYLENE SKIRT is flexible . . . seals against mounting surface and wire lead, providing a complete dust and moisture seal.
SNAP-IN MOUNTING PRONGS are shaped for easy push-in entry into mounting hole and snap outward to lock socket securely in place. Prongs are firmly anchored in plastic skirt.
AUTOMATIC GROUNDING of socket is provided by positive contact between mounting prongs and mounting surface.
available with springs and washers preassembled

NEW

plastic lamp socket

SEALS OUT MOISTURE and DUST

United-Carr's in-plant plastic molding facilities permit complete control of quality and performance in the manufacture of devices in which metal and plastics are combined. This enables United-Carr to offer truly comprehensive and reliable service on custom-designed fasteners and self-fastening electrical devices. For further information . . . sizes, prices, etc., contact your nearest United-Carr representative or write us direct.

UNITED-CARR
FASTENER CORPORATION
31 Ames Street, Cambridge 42, Massachusetts

MAKERS OF DOT FASTENERS

"We ought to label this box LOST PROFITS"

Why? Because you lose the original labor cost when any part has to be reworked. Such loss usually exceeds the manufacturing profit. Is "rework" eating into your profits — unnecessarily?

Why accept rework loss? . . . You don't have to accept this loss as "fixed". The point in production where you spot cracks or defects determines whether you lose both time and labor.

Inspection with Magnaflux during manufacture finds *all* cracks when they first occur—suggests the cause and how it can be corrected—*before* parts are run in quantity. Magnaflux keeps cracked parts from being machined, holds rework at minimum, reduces loss.

Cracks, whatever the cause, whether from heat treating, grinding . . . cleaning, or handling,—all run up your labor costs if you don't find them early enough.

Inspection with Magnflux is extremely low in cost, and is fast. Ask to have one of our engineers help you investigate how inspection with Magnaflux may save you money — or write for new booklet on LOWER MANUFACTURING COST.

MAGNAFLUX CORPORATION
7304 West Lawrence Avenue • Chicago 31, Illinois
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MAGNAFLUX

AIR engineering at work
REPORT No. 4400.05

Running Ten Nuts at a Crack...

SAVES $12,000 *a year!*

This large auto manufacturer formerly used two ¼ ton presses to position a differential carrier in the rear axle housing. Then the ten ⅜" nuts were run individually. Only experienced operators could control torque so that it met specifications. Naturally the engineers wanted to eliminate the press operation and improve torque control.

AIR engineering by Ingersoll-Rand provided the answer and saved $12,000 a year. A 10-Spindle Multiple Nut Runner is now suspended over the moving conveyor. The differential carrier is hand set on the housing, and dropped to within ⅛" of its final location. The 10-spindle nut runner quickly and accurately draws it into final position as it runs all 10 nuts at once . . . and to the required 50 ft. lbs. torque. The press operation is eliminated, and simultaneous running of the nuts eliminates binding.

If you are in any way responsible for cutting costs in your plant, write us on your company letterhead, and we will arrange for you to see I-R's confidential manual of reports on "AIR engineering at work".

Ingersoll-Rand Multiple Nut Runner runs 10 nuts at once, all to exact torque.

Ingersoll-Rand

11 Broadway, New York 4, N.Y.

AIR engineering Manual

Don't miss over 100 interesting case history applications of AIR engineering in this confidential manual.

8-147

Nuts produced by Lamson & Sessions, Cleveland, Ohio.

Get more production with this

SCRAPLESS NUT QUALITY WIRE

Youngstown Scrapless Quality Nut Wire. The wire with the accurate sizing. The right composition. The wire that measures up to chemical and metallurgical checks for analysis. Micro-examinations, too.

Scrapless Quality Nut Wire with these qualities feeds smoothly through your machines. There is less downtime. Fewer rejects. And severe die wear is lessened.

Next time you order Scrapless Quality Nut Wire, be sure you get Youngstown. It's available in a good range of compositions, including AISI Standard as well as special re-sulphurized steels. For more information, call your nearest Youngstown District Sales Office.

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices: Stambaugh Building - - Youngstown 1, Ohio
Plants: Youngstown, Ohio; Struthers, Ohio; Indiana Harbor, Indiana

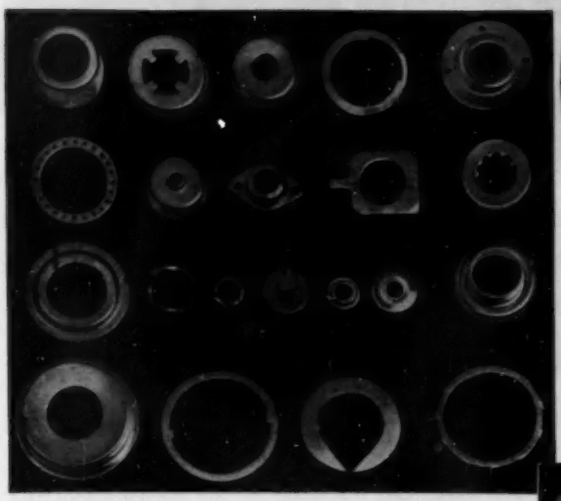
SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - BAR SHAPES - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - RAILROAD TRACK SPIKES - MINE ROOF BOLTS

LEADERSHIP *Backed by*

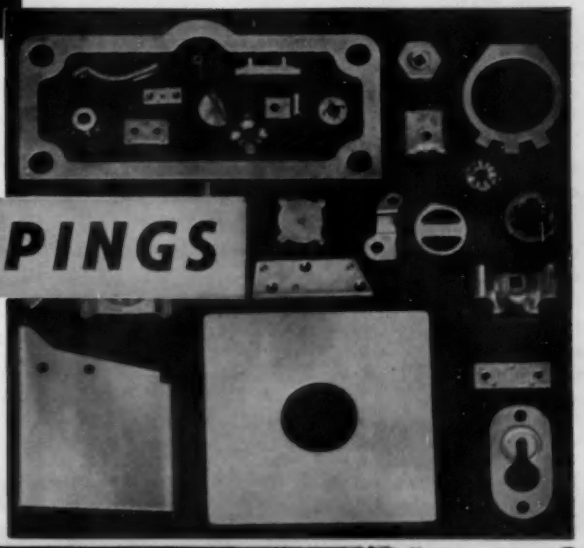
68 Years of Continuous Service to American Industry

MILWAUKEE WROT WASHERS

SINCE 1887



In terms of "satisfaction to the customer" the dominant leadership of Wrought Washer Mfg. Company in this specialized field represents not only a thoroughly dependable source of supply to meet all your requirements for Standard and Special Washers, but of equal importance, it carries with it a wealth of technical know-how dealing with a wide variety of production and design problems . . . available to you as a gratis service. More than 25,000 sets of dies "in stock" at our plant offer the greatest range of selectivity.



STAMPINGS

Our equipment for handling contract production of stampings includes presses for blanking, forming, drawing, shearing and extruding. In many cases it is possible to produce stampings at a lower cost than they can be produced in your own plant, with our own equipment. Our own tool and die-making shop enables us to make up the necessary tools to fit your specifications.

We are equipped to furnish stampings in any desired materials and finishes, ranging in size from small parts to large heavy-gauge pieces. Our engineering staff will be glad to co-operate with you in every way consistent with economical and efficient production.

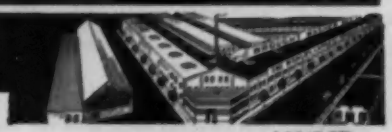
• • •

Send us your blueprints for quotations on special washers and stampings made to your individual specifications. Write for copy of 76-page Catalog "30" with tool list and complete round washer specifications.

WROUGHT WASHER MFG. CO.

THE WORLD'S LARGEST PRODUCER OF WASHERS

2212 SOUTH BAY STREET — MILWAUKEE 7, WISCONSIN



A8247-IP

JERVIS B. WEBB

CONVEYOR ENGINEERING, MANUFACTURE, INSTALLATION and AUTOMATION

Webb Trolley Conveyors automatically transport parts and sub-assemblies to final assembly line.

MATERIALS HANDLING...

42 rollover and turntable stations, designed by Webb, index blocks 90° or 180° for machining operations.

Automation at Plymouth

Four miles of Webb Trolley type overhead transport conveyors have given the new Plymouth engine plant a higher degree of efficiency than they have ever had before. In engineering the layout for the new plant, Plymouth's goal was to achieve flexible and continuous production flow with a minimum of manual handling. Webb custom-engineered conveyor systems . . . 26 conveyor lines . . . have provided the answers for Plymouth.

Of particular interest is the high degree of automation designed by Webb engineers into the engine block production line. A Webb two-strand indexing type chain conveyor provides positive flow control for engine block production. Also, Webb engineers designed twenty rollover stations where engine blocks are automatically rotated 90° or 180° on the vertical axis to put them into position for the next machining operation. In addition, twenty-two Webb designed turntables index the blocks 90° on the horizontal axis for another machining operation.

Complicated automatic control systems and the control panels were designed and built by Control Engineering Co., a subsidiary of Jervis B. Webb Co. These control panels furnish a visual check on material flow and the operation of the conveyor systems.

This installation is another example of how manufacturers are turning to Webb conveyor engineers for answers to their materials handling problems. Regardless of your needs—single line conveyor or a complete plant conveyor system — Webb engineering service will provide the economical and efficient answer to your materials handling requirements.

Write to us on your company letterhead and we will be happy to place your name on the Webb mailing list to receive factual technical information on conveyor installations, case history reports, and new product literature.

JERVIS B. WEBB CO.

Specialists in Custom Conveyor Systems

8937 ALPINE AVENUE • DETROIT 4, MICHIGAN

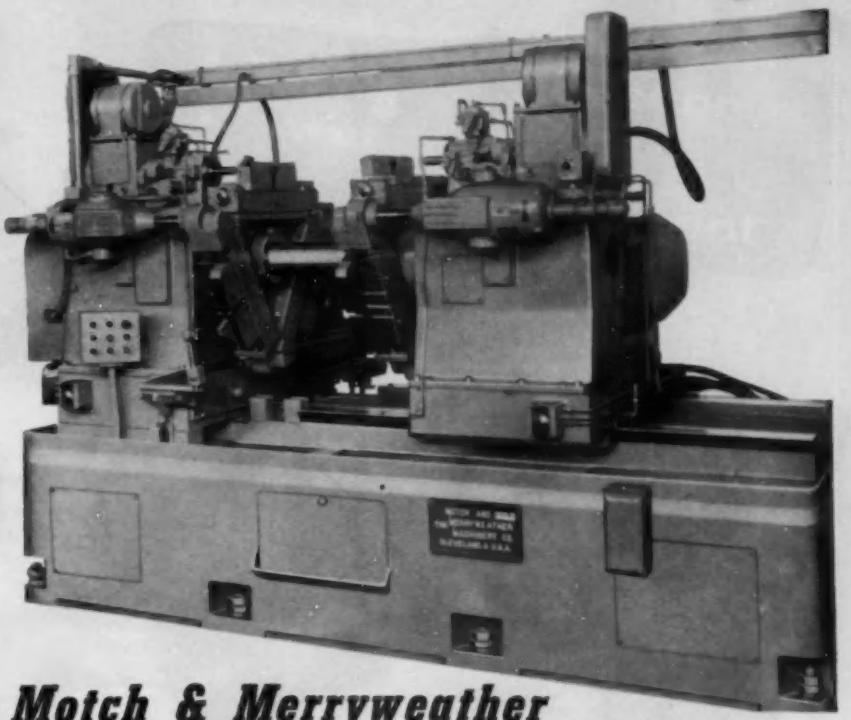
Offices and Representatives Throughout The World • **FACTORIES:** ***Detroit*** • ***Los Angeles*** • ***Hamilton, Canada***

Heavy Duty

Rigid

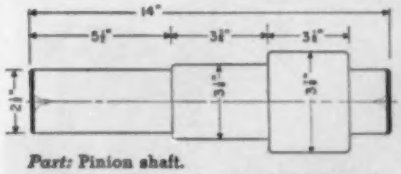
Accurate

Productive



The Motch & Merryweather
No. 3-MCT Milling and Centering Machine
FOR UNIVERSAL PRODUCTION

Adopt this Active Asset to Automation



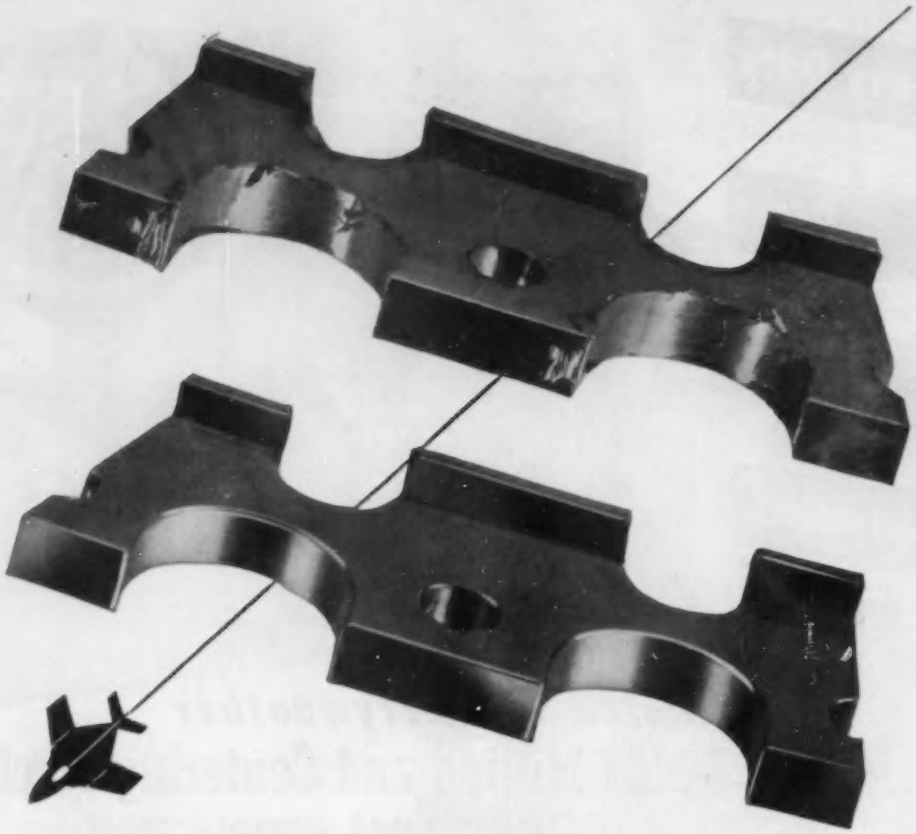
Part: **Pinion shaft.**
Operation: **Mill and center drill both ends.**
Production: **220 pieces per hour.**

Mass production, yet with extreme accuracy, — that is the central requirement for preparing parts which go to your automatic equipment. Begin automation *right* by preparing your parts *right* on the Motch & Merryweather 3-MCT Milling and Centering Machine. This universal heavy duty unit excels for high single-purpose production, while quick set-up makes short runs profitable. Automatic loading and unloading may be incorporated to handle extremely high production. The 3-MCT performs with a dispatch and precision hitherto unknown.

THE MOTCH & MERRYWEATHER MACHINERY CO.

MACHINERY MANUFACTURING DIVISION
CLEVELAND 13, OHIO

Builders also of Production Milling, Vertical Turning, Automatic and Special Machines

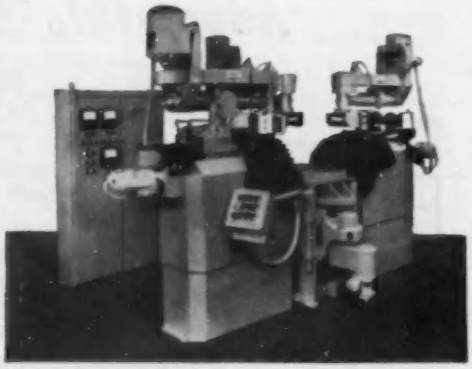


New standard in finishing

EXTREME temperatures and stresses set up in jet engines cause unprecedented strains on metal components.

Fatigue and failure producing concentrations of stress in a ring component—sections shown above—are eliminated by blending surface junctures with Osborn Brushamatic power brushing. Replacing undependable hand methods, power brushing produces the highest quality finish ever achieved. It speeds up production and inspection . . . eliminates rework.

It will pay *you* to have an Osborn Brushing Analysis made of your finishing operations. Write *The Osborn Manufacturing Company, Dept. E-35, 5401 Hamilton Avenue, Cleveland 14, Ohio.*



Osborn's 51-3L Brushamatic cleans and finishes metallic and non-metallic parts up to 8 feet in diameter, 3500 pounds in weight

COMPLETE DATA—For information on power brushes and brushing methods write today for Osborn's Catalog 300.

Osborn Brushes

OSBORN

BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES
BRUSHING MACHINES • FOUNDRY MOLDING MACHINES

MBI

• greater production
• lower costs
• smaller investment

PRECISION DESIGNED AND BUILT TO MEET THE REQUIREMENTS OF THE AGE OF AUTOMATION

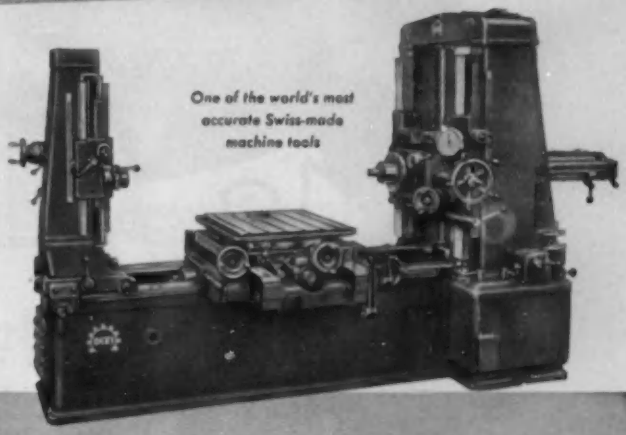
Dixi 60

Horizontal Jig Borer

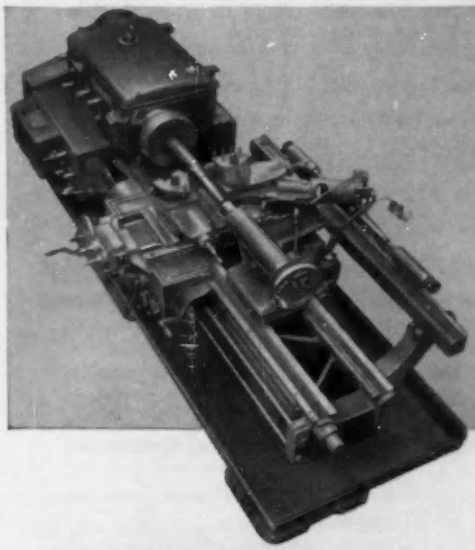
With 5 optical microscopes

A precision machine for boring, drilling, recessing, and milling work. Built-in rotary table with optical microscope can be rotated 360°. Headstock, column, and table settings by optical microscopes to insure overall accuracy of .0002". Table and spindle head have variable hydraulic feed. Mechanical spindle feed can be changed without stopping spindle and is provided with automatic depth stop.

No. 40 taper spindle. Spindle speeds 32-1350 R.P.M. Feeds .0015"—.010" per rev. Table size 28¾" x 32⅝" max. distance spindle to table 19¾". Table travel 23⅝". Spindle travel 24.4".



One of the world's most accurate Swiss-made machine tools



Heavy Duty Lathe *High Precision, Reliability, Top Performance Schaerer Model UN-450*

Twin cross slides. Copies from cylindrical or flat template either longitudinally or cross. Twin slides permit rough turning and finish turning in the same operation in many instances. Swings 17¼" over bed, 9" over carriage, 20-5/64" over gap. Center distance 60". Spindle speeds 31.5 to 1400 R.P.M.

Hydraulic copying attachment can be removed to permit use as a regular twin slide lathe when necessary. 10 H.P. motor drive to spindle. Separate motors for coolant and hydraulic pump. A production lathe built to tool room standards.

- *Guaranteed Service by Trained Staff*
- *Engineering Staff will make recommendations based on your requirements*
- *Spare parts in Stock*
- *Your Operators Trained*
- *Early Deliveries — Some from Stock*
- *Competitive Prices*
- *Financing and Rental Plans to Meet Your Requirements*

Many More Machines for Every Operation
Write for free illustrated brochure 100, or state your specific requirements

Write for complete details and prices to Dept. 21

M.B.I. EXPORT & IMPORT LTD.

A Division of Machinery Builders Inc.

475 Grand Concourse, Bronx 51, N. Y.

"Over 20 years experience in designing & building machinery"

CABLE ADDRESS: Machbuild New York

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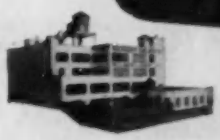
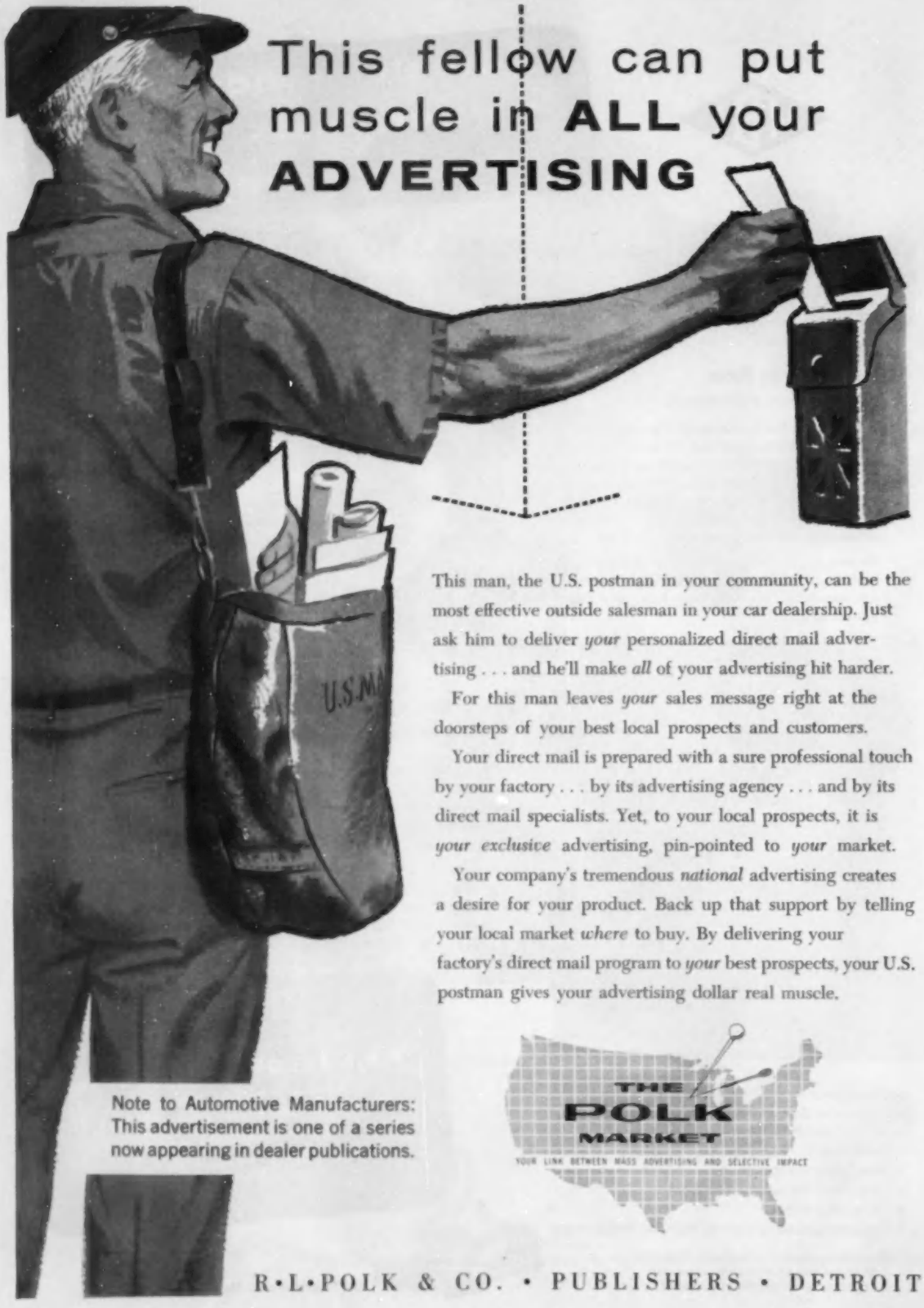


Our Headquarters in New York City

This fellow can put muscle in **ALL** your **ADVERTISING**



This man, the U.S. postman in your community, can be the most effective outside salesman in your car dealership. Just ask him to deliver *your* personalized direct mail advertising . . . and he'll make *all* of your advertising hit harder.

For this man leaves *your* sales message right at the doorsteps of your best local prospects and customers.

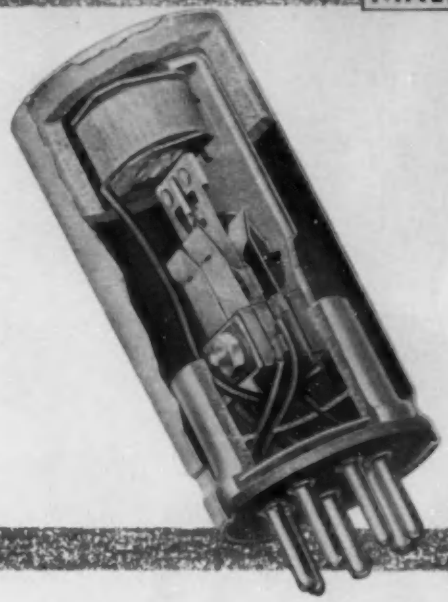
Your direct mail is prepared with a sure professional touch by your factory . . . by its advertising agency . . . and by its direct mail specialists. Yet, to your local prospects, it is *your exclusive* advertising, pin-pointed to *your* market.

Your company's tremendous *national* advertising creates a desire for your product. Back up that support by telling your local market *where* to buy. By delivering your factory's direct mail program to *your* best prospects, your U.S. postman gives your advertising dollar real muscle.

Note to Automotive Manufacturers: This advertisement is one of a series now appearing in dealer publications.

R·L·POLK & CO. • PUBLISHERS • DETROIT

MALLORY



New 1700 series Mallory split-reed vibrator uses special alloy leaves which serve both as contacts and as springs . . . eliminating usual button contacts. Life is greatly increased, constancy of output improved, and driving power reduced.*

*Patent Applied For

New Heavy Duty Mallory Vibrator

gives far longer life, constant output

For the peak in dependability and performance, plan to use this newest Mallory vibrator in your communications equipment. A completely new idea in vibrator design eliminates conventional contact buttons. The spring leaves themselves . . . made of special contact alloy . . . act as contacting members. This design provides greatly increased contact area, with these important advantages:

Consistently Longer Life. Tests made on heavy duty cycles prove up to 100% greater service can be expected . . . with a high degree of consistency.

Steadier Output. The decreased rate of erosion means less change in contact spacing, less variation in voltage.

Flare-Proof Starting. The new low-mass design permits wider contact spacing to prevent start-up flare . . . without need for greater driving power.

Exceptional Uniformity of characteristics is made possible by the simplified design.

Minimum Size for heavy duty ratings.

The new design is available in the split-reed type shown here, for 6/12 volt service, and in the Duplex heavy duty model without the split reed construction. For full technical data, and for a consultation on your specific power supply requirements, write or call Mallory.

COMPLETE POWER SUPPLIES

It may be that you can save time and reduce over-all costs by employing a complete Mallory Vibrapack® power supply. Vibrapacks can be engineered around the new heavy-duty 1700 series vibrator to give long, reliable service. Design includes precise balancing of critical components. Normal ratings are conservative. Compact-sized Vibrapacks fit readily into crowded layouts. For further information, advise Mallory of your specific requirements.

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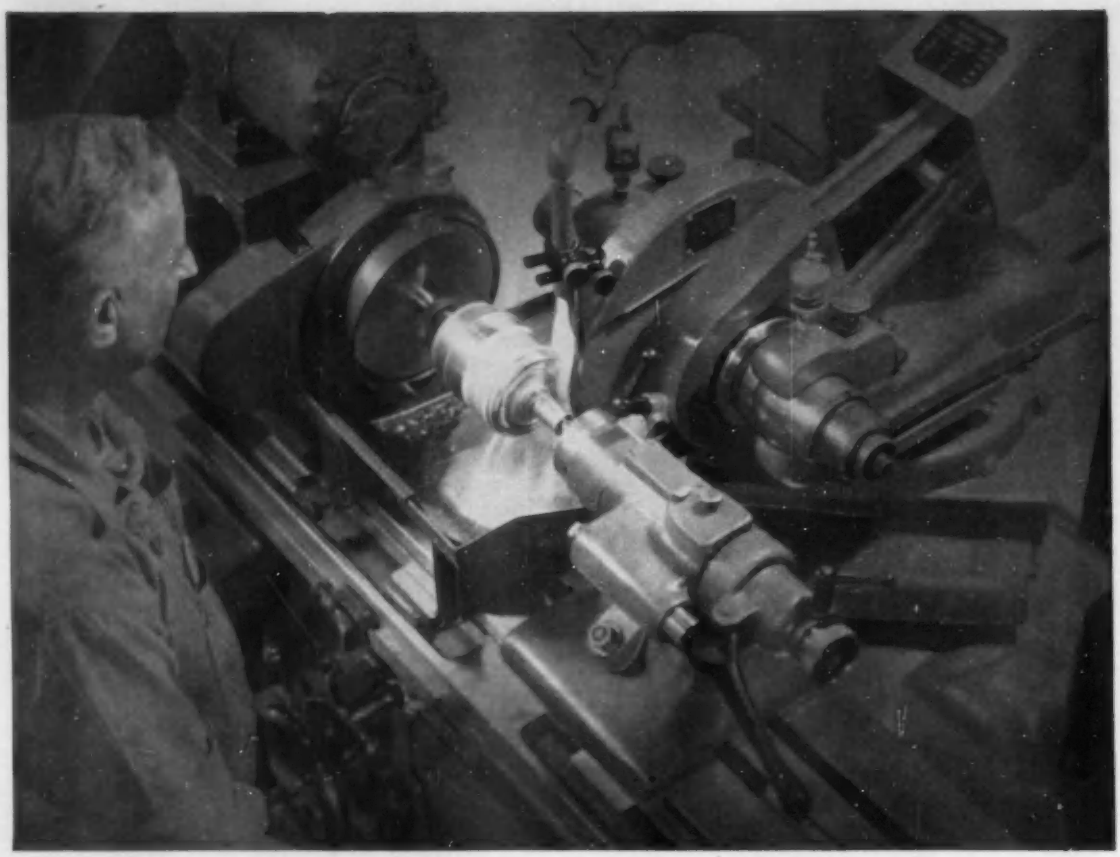

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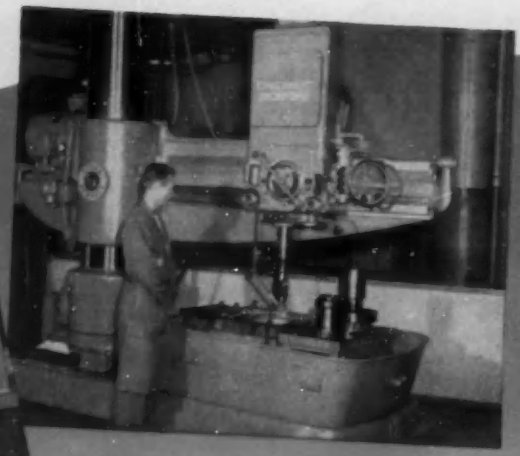
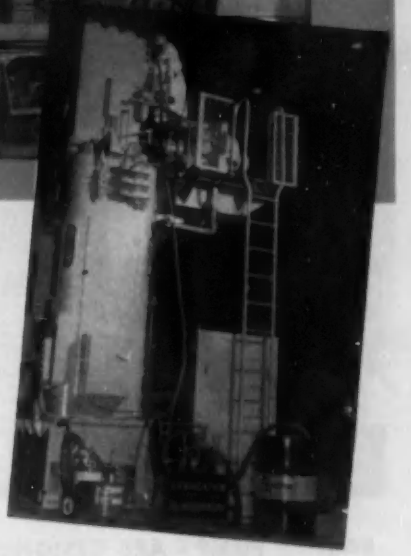


90 machine tool exhibitors can't be wrong!



90 MANUFACTURERS OF MACHINE TOOLS exhibiting at the recent show in Chicago used *Houghton* lubricants, greases, coolants, cleaners or rust preventives to make sure their equipment gave the *best performance possible* before their 100,000-man audience!

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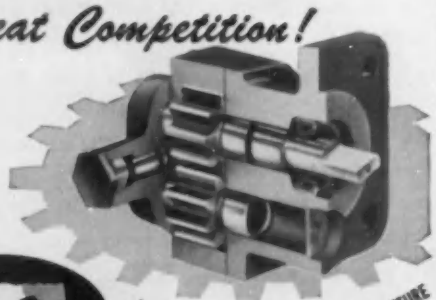

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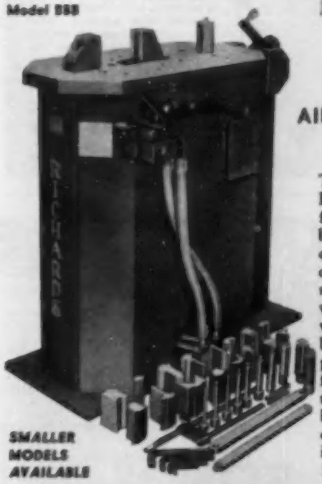
Multiform

BIG BROTHER BENDER

Model BBB



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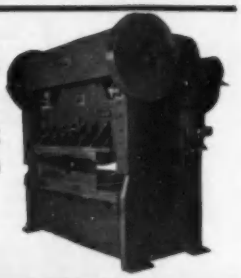

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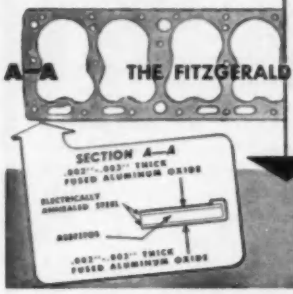

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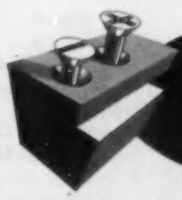

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Index to Advertisers

This Advertisers' Index is published as a convenience, and not as part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert

A

A C Spark Plug Div. 77
Acadia Div. Western Felt Wks. 10
Aeroquip Corp. (Marman Products Co.) 189
Aetna Ball & Roller Bearing Co. 11
Ajax Mfg. Co. 127
Allen Industrial Products, Inc. 211
Allen Mfg. Co. 219
Allison Div. G. M. 214-215-224
Aluminum Co. of America 218
American Bosch Div. American Bosch Arma Corp. 199
American Machine & Foundry Co., 3rd Cover
American Steel & Wire Div. 235
Anchor Coupling Co., Inc. 158
Armstrong Cork Co. 48
Aro Equipment Corp. 114
Associated Spring Corp. 46
Auto Specialties Mfg. Co. 197
Automatic Spring Coiling Co. 142

B

Bakelite Co. 173
Baker Bros., Inc. 183
Barnes Corp., John S. 260
Barnes-Gibson-Raymond 46
Bellows Co. 223
Bendix Aviation Corp.
Products Div. 34
Zenith Carburetor Div. 16
Bendix-Westinghouse Automotive Air Brake Co. 109
Bethlehem Steel Co. 228
Binks Mfg. Co. 164
Borg & Beck Div. 156
Bundy Tubing Co. 12-13
Burton Auto Spring Corp. 8

C

Chambersburg Engrg. Co. 181
Chicago Rawhide Mfg. Co. 167
Chicago Rivet & Machine Co. 162
Cincinnati Milling Machine Co. 25
Clark Equipment Co. 117-118
Clearing Machine Corp. 153
Cleveland Punch & Shear Wks. Co. 230
Colonial Broach & Machine Co. 33
Columbia-Geneva Steel Div. 235
Consolidated Machine Tool Co. 28-29
Continental Diamond Fibre Div. Budd Co., Inc. 208
Continental Motors Corp. 243
Cook Plant 46
Coolidge Corp. 110

D

Dana Corp. (Spicer) 132-133
Davis & Thompson Co. 202
Delco-Remy Div. 184-185
Detroit Controls Corp. 122
Dole Valve Co. 150
Dreis & Krump Mfg. Co. 262
Dunbar Brothers Co. 46

du Pont de Nemours Co. (Photo Products Dept.) 233
Dykem Co. 262

E

Eaton Mfg. Co.
Dynamatic Div. 31
Valve Div. 80
Efficient Tool & Die Co. 222
Elastic Stop Nut Corp. 47
Elco Tool & Screw Corp. 261
Electric Auto Lite Co. 107
Emery Co., A. H. 136

F

Fairchild Engine & Airplane Corp. 168
Fairfield Mfg. Co. 146
Farval Corp. 82
Fasco Industries, Inc. 138
Federal Machine & Welder Co. 174
Federal Mogul Div. Bower Bearings, Inc. 226
Fellows Gear Shaper Co. 262
Felters Co. 120
Fitzgerald Mfg. Co. 263
Follansbee Steel Corp. 186
Foote-Burt Co. 50
Fuller Mfg. Co. 229

G

Gear Grinding Machine Co. 220-221
General Controls 239
General Electric Co. 225
General Tire & Rubber Co. 210
Gisholt Machine Co. 17 thru 20
Globe-Union, Inc. 179
Gordon Co., Claud S. 206
Great Lakes Steel Corp. 105
Grip Nut Co. 260
Gunite Foundries Corp. 227

H

Hannifin Corp. 23
Harvey Aluminum Sales, Inc. 203
Heald Machine Co. 2nd Cover
Hoppenstall Co. 165
High Efficiency Div. Lindberg Engineering Co. 30
Holley Carburetor Co. 139
Houdaille-Hershey of Ind. 169
Houghton & Co., E. F. 258-259
Howell Electric Motors Co. 128
Hyatt Bearings Div. 5
Hy-Pro Tool Co. 95

I

Illinois Tool Wks. 121
Imperial Brass Mfg. Co. 200
Inland Mfg. Div. 22
Ingersoll-Rand 247

J

Johnson Bronze Co. 232
Johnson Products, Inc. 166
Jones & Laughlin Steel Corp. 137-145-242

K

Kasle Steel Corp. 262
Kearney & Trecker Special Machinery Div. 49
Keller Tool Div. 237
Kelsey Hayes Wheel Co. 152
Kent-Owens Machine Co. 123
King-Seeley Corp. 216
Kingsbury Machine Tool Corp. 191

L

Lake Erie Engrg. Corp. 160-161
Lamb Electric Co. 172
La Pointe Machine Tool Co. 159
Lindberg Industrial Corp. 30-170-171
Linde Air Products Co. 32
Link Belt Co. 143
Lipe Rollway Corp. 116
Lodge & Shipley Co. 238
Long Mfg. Div. 131
Luber-Finer Inc. 201

M

McKay Machine Co. 207
McLouth Steel Corp. 151
M. B. I. Export & Import, Ltd. 253
Mac Lean-Fogg Lock Nut Co 263
Magnaflux Corp. 246
Marman Products Co., Inc. 189
Mallory & Co., P. R. 255
Mattison Machine Wks. 2
Miller Fluid Power Co. 78-79
Michigan Drill Head Co. 257
Micromatic Hone Corp. 21
Milford Rivet & Machine Co. 261
Milwaukee Div. 46
Modern Industrial Engrg. Co. 188
Moline Tool Co. 194
Moraine Products Div. 175
Morse Chain Co. 195
Motch & Merryweather Machinery Co. 251
Murray-Way Corp. 244
Muskegon Piston Ring Co. 92

N

Nadella 234
National Broach & Machine Co. 129
National Machinery Co. 204-205
National Malleable & Steel Castings Co. 190
National Motor Bearing Co. 176-177
National Screw & Mfg. Co. 81
National Steel Corp. 105
National Tube Div. 235
New Departure Div. 44
Niagara Machine & Tool Works 124-125
Norton Company 140-141

Index to Advertisers
—continued

O

Oakite Products, Inc. 209
Osborne Mfg. Co. 252

P

Palnut Co. 198
Peters-Dalton, Inc. 147
Polk & Co., R. L. 254

R

Ransburg Electro Coating Corp. 192-193
Rathborne, Hair & Ridgway Box Co. 144
Raymond Mfg. Co. 46
Reliance Electric & Engrg. Co. 163
Republic Steel Corp. 26-27
Richards Co., J. A. 261
Richardson Co. 241
Rochester Products Div. 231
Rockford Clutch Div. 182
Ross Gear & Tool Co. 9
Roto-Finish Co. 134
Ryerson & Son, Inc., Jos. T. 36

S

Schwitzer Corp. 101
Sealed Power Corp. 4
Shakeproof Div. 121
Sheffield Corp. 217
Shell Chemical Corp. 148-149
Southern Screw Co. 263
Stewart-Warner Corp. 24
Stuart Oil Co., Ltd., D. A. 256
Sturtevant Co., P. A. 262
Sun Oil Co. 6-14-15
Superior Steel Corp. 115
Synchro Start Products, Inc. 103

T

Taylor Dynamometer & Machine Co. 180
Temco Aircraft Corp. 51
Tennessee Coal & Iron Div. 235
Thompson-Bremer & Co. 3rd Cover
Timken Detroit Brake Div. 111
Timken Roller Bearing Co. Back Cover
Tomkins-Johnson Co. 196
Torrington Co. 99
Towmotor Corp. 155
Tulsa-Winch Div. 265
Tung Sol Electric, Inc. 108
Twin Disc Clutch Co. 126

U

U. S. Axle Co. 130
Union Carbide & Carbon Corp. 32-173
United Air Lines, Inc. 236
United-Carr Fastener Corp. 245
United States Steel Corp. 235
United States Steel Supply Div. 235
Universal Oil Seal Co. 206

V

Vellumoid Co. 262
Vickers, Inc., Div. of Sperry Rand Corp. 135
Victor Mfg. & Gasket Co. 7

W

Wagner Brothers, Inc. 112-113
Wagner Electric Corp. 154
Waterman Products Co. 178
Waukesha Motor Co. 1
Wean Equipment Corp. 157
Webb Co., Jervis B. 250
Western Felt Works 10
Westinghouse Electric Co. 212-213
Wheland Co. 240
Wittek Mfg. Co. 201
Wrought Washer Mfg. Co. 249

Y

Yates-American 119
Young Spring & Wire Co., L. A. 187
Youngstown Sheet & Tube Co. 248

Z

Zollner Machine Works 266

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TULSA* POWER TAKE-OFFS

Light, compact, durable, quiet—that's the story of the new TULSA POWER TAKE-OFFS . . . The heat-treated aluminum alloy housings permit more payload . . . Compact design saves installation man-hours . . . Quality and durability of gears, shafts, and yokes are assured because of "controlled atmosphere" carburizing and hardening . . . As an extra refinement, all gears are shaved resulting in extremely quiet operation. And last but not least, prices are very low. One-speed forward and two-speeds forward models, all reversible, are available for every power take-off application.

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BOND LOC*

For Extra Heavy Duty Service

PISTONS

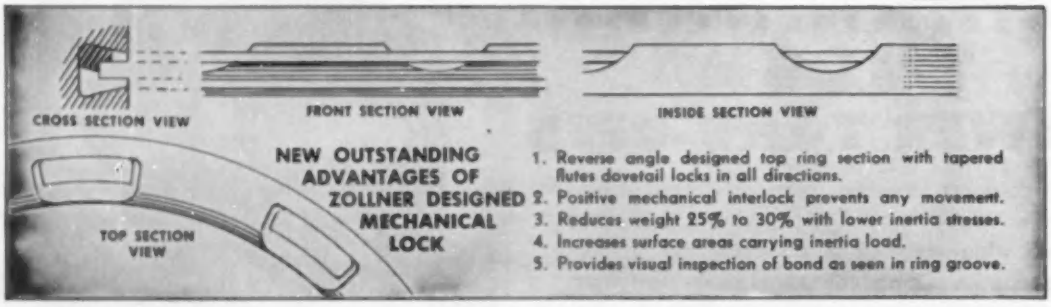
STOPS! RING GROOVE WEAR

Double Bonded

METALLURGICALLY Al-Fin Bond

MECHANICALLY Zollner Lock

Up to 5 times more mileage is typical of this great new piston development by Zollner engineers. Designed for the most severe service, the BOND-O-LOC Piston has a "Ni-resist" iron top ring groove section *permanently* incorporated by *both* Al-Fin metallurgic bond and the exclusive Zollner mechanical lock. Separation failure is impossible. Reverse angles on every surface joining the "Ni-resist" iron section provide a multiple dovetail bond which is infinitely wedge-locked. Ring groove wear problems are eliminated, blow-by prevented, oil consumption reduced, mileage between overhauls greatly increased. Many heavy duty engine builders have already tested and approved BOND-O-LOC advantages. Request complete information, now.



NEW OUTSTANDING ADVANTAGES OF ZOLLNER DESIGNED MECHANICAL LOCK

1. Reverse angle designed top ring section with tapered flutes dovetail locks in all directions.
2. Positive mechanical interlock prevents any movement.
3. Reduces weight 25% to 30% with lower inertia stresses.
4. Increases surface areas carrying inertia load.
5. Provides visual inspection of bond as seen in ring groove.

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- ADVANCED ENGINEERING
- PRECISION PRODUCTION

in cooperation with engine builders

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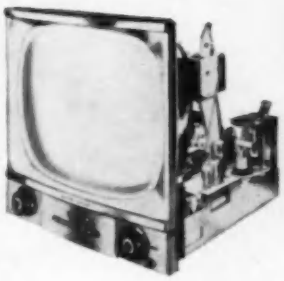
THE ORIGINAL EQUIPMENT PISTONS

ZOLLNER

ZOLLNER MACHINE WORKS • Fort Wayne, Indiana

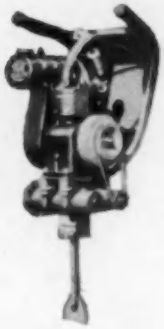
Everlock®



Admiral

Placed at strategic spots throughout the chassis, EVERLOCK lockwashers keep Admiral TV sets tight—permanently.

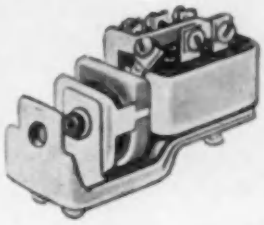
Everlock®



MASTER TAMPER

8650 jolts per minute, hour after hour, can't shake loose the EVERLOCK lockwashers on the Master Tamper.

Everlock®



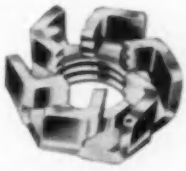
R-B-M SWITCHES

Specially designed EVERLOCK lockwashers provide permanent, vibration-proof fastenings on R-B-M automotive foot dimmer, headlamp and horn switches.

Everlock®... In the Picture

Wherever Positive Grip Counts

Lockwashers



Locknuts

Screw-Lockwasher Assembly

Another AMF Product
Everlock
INDUSTRIAL FASTENERS

EVERLOCK lockwashers' exclusive alternating chisel edges bite into the face of the work *and* the nut under powerful spring tension . . . hold fast even under the most severe jars, jolts and vibration. Available in four standard types or to your own specifications, EVERLOCK lockwashers provide the positive holding power demanded by more and more manufacturers of quality products. Next time you order lockwashers be sure to specify AMF EVERLOCK.

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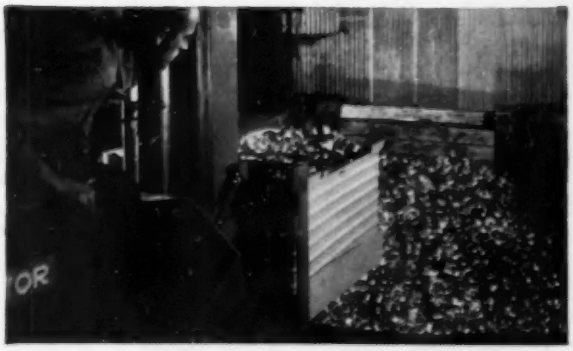
One number that's worth a thousand words

WE MEASURE ONE MILLIONTH OF AN INCH with this machine, recording contours and smoothness of circular surfaces. Such research helps make Timken bearings truer, smoother. Result: they give quieter, longer-lasting performance in your car's moving parts —the vital zone.

OUR OWN NICKEL-RICH FINE ALLOY STEEL makes Timken bearings tougher. The Timken Company is the only bearing manufacturer in the country that is able to control bearing quality at every step in production—from melt shop through final bearing inspection. Our steel-making specialists use the exact amount of nickel to give Timken bearings the toughness they need to withstand shock, last longer.



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